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Vol. XXXII. Part 7.

P AGRIC A

THE AGRICULTURAL GAZETTE OF NEW SOUTH WALES

STORAGE

JULY 1921

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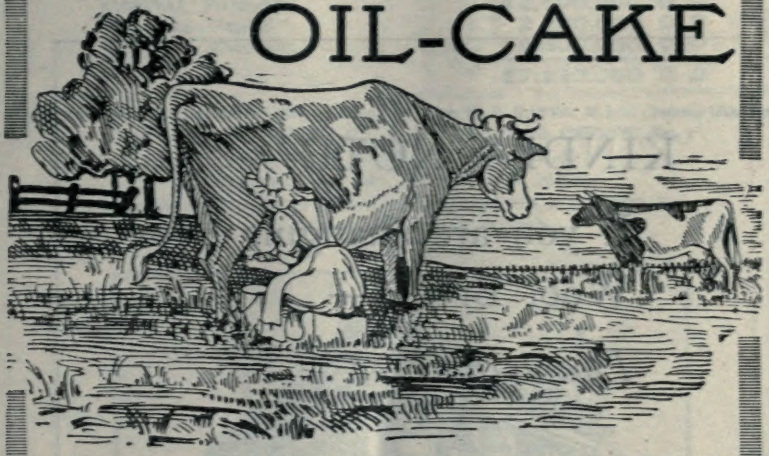

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I am enclosing cheque for Oil-Cake. It took me a long time before I could get the cows to eat it but they got to like it by degrees, and the result is entirely satisfactory. I really do not know of a substance that could give a better result. I regret very much that I did not have it earlier, and I feel sure I would have doubled my supply of cream. One of my cows was nearly dry, and was not giving more than a pint of milk per day. Now she is giving 1½ gallons. Certainly some of the result is due to the increased supply of grass, but from the time I got her to eat the Oil-Cake she steadily improved and is continuing on the improve.

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See that the name "Sunlight" is branded on every cake

To Graziers and Settlers.

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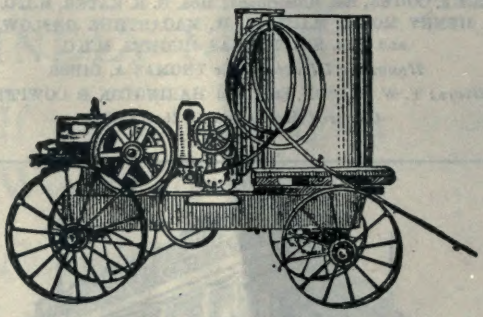

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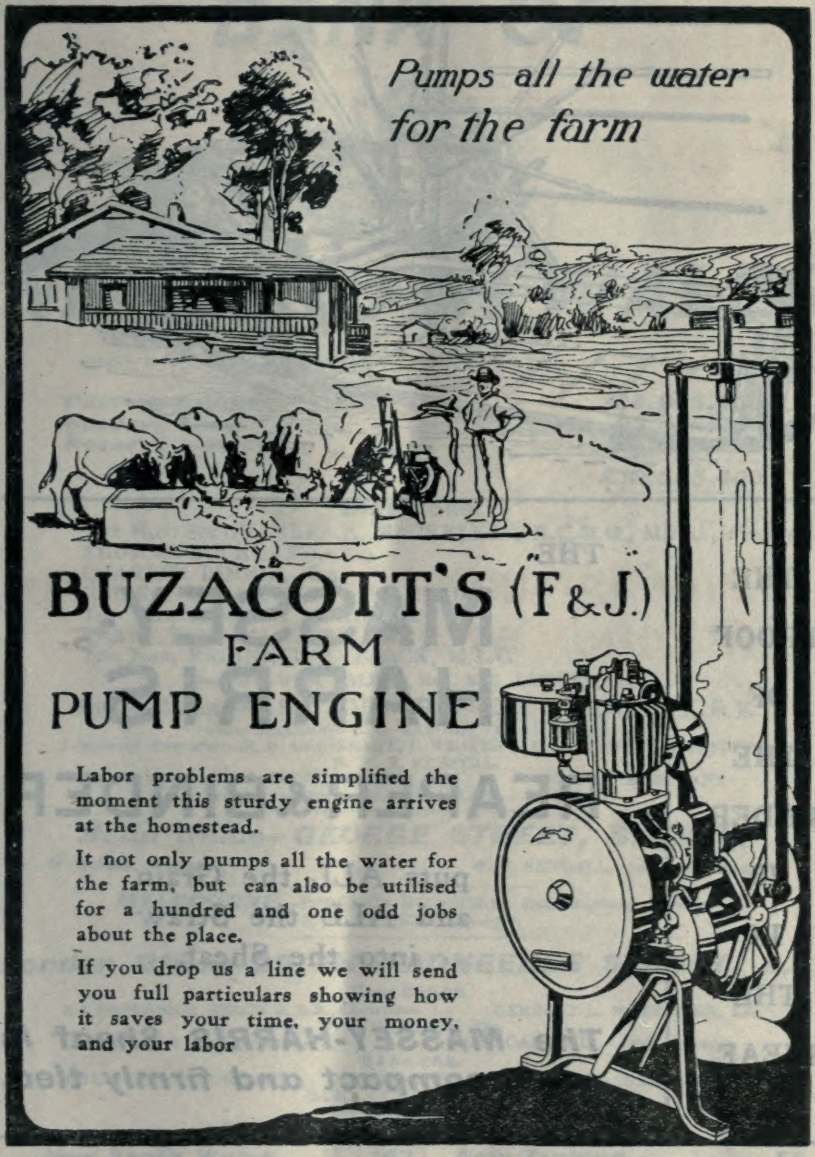

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Labor problems are simplified the moment this sturdy engine arrives at the homestead.

It not only pumps all the water for the farm, but can also be utilised for a hundred and one odd jobs about the place.

If you drop us a line we will send you full particulars showing how it saves your time, your money, and your labor

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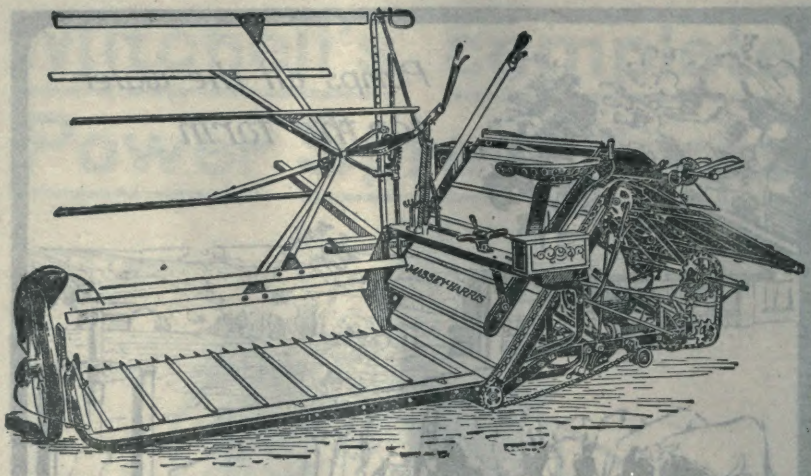

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puts ALL the Grain
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into the Sheaf.

The MASSEY-HARRIS Sheaf is neat, compact and firmly tied.

Sample Machines may be inspected
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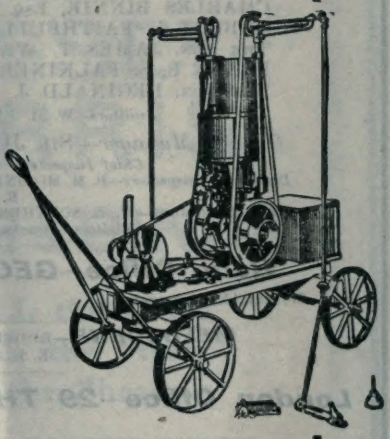
A PLANT "WORTHY OF ITS HIRE"

Cooper "Little Wonder"

2-stand SHEARING and CRUTCHING OUTFIT



Every Little Wonder in use has maintained the record for service that has earned for this machine an enviable reputation throughout Australia.

It has successfully settled the shearing and crutching problem for over 1,000 Australian Wool Growers.

Write to-day for illustrated leaflet giving full particulars of this popular outfit.

Larger or smaller outfits of the same high quality can also be supplied.

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Illustrated here are two separators which will win on points under any comparison.

THE

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skims as fast as ten men can milk, and skims every minute particle of cream.

The high speed of the bowl never varies — hour after hour. The cream flow is perfect. There is no waste.

Price—**£75**

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No other hand-separator has attained such popularity, because no other is so convenient, speedy, thorough, and reliable. It is a wonderfully efficient close-skimmer that saves all the cream.

All gears are enclosed, and therefore absolutely dust-proof. All ball-bearings are interchangeable and adjustable.

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One CLETRAC in the orchard or small farm makes an ideal all-year power plant, is light and powerful, with plenty of pull for heavy ploughing and work in the hills.

Turns short and works the corners clean, compact and low set, ideal for orchard work. Runs on Kerosene.

DOES ANYTHING—GOES ANYWHERE.

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54,000 Gallons for a Penny.

JUST think of it! One week's work by an 8 ft. "Comet" Windmill elevating water to 20 ft. with simply a steady breeze for power! Where is the engine-driven plant that will give you this service at such a trifling cost —without any attention?

To pump 54,000 gallons with an oil-engine outfit costs about 8s. for fuel. Then think of the bother of starting, stopping, feeding and cleaning—the trouble with ignition, carburetion and gears.

The "Comet" Windmill is the ideal outfit for low-cost pumping, and we support it with a **3 YEARS' GUARANTEE.** The first "Comet," made 35 years ago, is still going strong on a Queensland station, and the bearings have never been renewed.

Before you think of any other mill, write for Catalogue and Prices of "Comet" Mills to nearest branch of

"'COMET' FIRST"
says Mr. O'Brien.

Stamford Downs, Stamford.
The 24 ft. Mill supplied by you some time back has proved most satisfactory. As it waters 14,000 sheep, and lifts the water 150 ft., it speaks volumes for the capacity of the "Comet" Mill; the only expense was oil. If I were asked which was the best mill in the market, "'Comet' first, the rest nowhere."
(Sgd.) JOHN O'BRIEN.

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Here, however, he may reap the benefit of mutual aid, and link his interests with an unique sales-service.

The P.F.A. Wool Service

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The Pastoral Finance Association Ltd.

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STUD DAIRY CATTLE.

Always Available

Young Bulls from Tested Stock.

Watch for Yearly Annual Sales

at the Farms and Royal Agricultural Show of

Females of Best Milking Strains.

MILKING SHORTHORN BULL.

Melba's Emblem of Darbalara (461, M.S.H.B.).

Sire, Emblem of Darbalara (100 M.S.H.B.)

Dam, Melba III of Darbalara (1058 M.S.H.B.)

Yield of Dam, 15,239 lb. milk and 653·65 lb. butter in 365 days.

Melba's Emblem of Darbalara was Reserve Champion Milking Shorthorn Bull, R.A.S., Sydney, 1920.

OTHER SIRES IN USE:

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Yield of Dam, 12,324 lb. milk and 579 lb. butter in 365 days.

COMRADE OF DARBALARA (Vol. V, M.S.H.B.), by Silver Mine of Darbalara (592).

Yield of Dam, 8,436 lb. milk and 398 lb. butter in 273 days as a 2-year old.

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Yield of Dam, 9,163 lb. milk and 419 lb. butter in 365 days when 16 years old.

MILKING SHORTHORN COW.

Gibson Girl (1,465, Imp.).

Yield, 10,702 lb. milk and 494·79 lb. butter in 365 days.

G. VALDER,

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STUD DAIRY CATTLE.

Representatives of the Government Herds.

JERSEY BULL.

Xmas Fox (imp.) (947.)

Sire, Silver Fox (10,097, E.H.B.)

Dam, Malvoisie (Vol. XX, E.J.H.B.)

Butter record of Dam, Royal Counties Show, England, 2 lb. 6¼ oz. from 49 lb. milk in 24 hours, 165 days after calving.

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GODDINGTON NOBLE XV (948) (imp.)
Yield of Dam, 8,150 lb. milk; butter yield, 1 lb. 11 oz. from 32 lb. milk in 24 hours as 3-year old.

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JANET QUEEN 4TH'S BRIGHTON of Coolangatta, by Brighton King of Coolangatta.

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JERSEY COW.

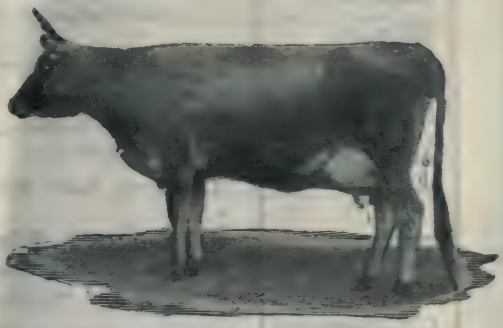
Glory Quayle (4,822)

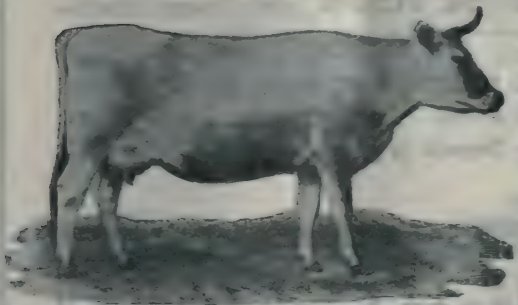
Yield, 8,592 lb. milk and 495·48 lb. butter in 273 days (second calf).

Sire, Xmas Fox (947) (imp.)

Dam, Egypt's Glory (383).

Yield of Dam, 6,154 lb. milk and 399 lb. butter in 365 days as 3-year-old.





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Wagga Jasmine (2,779).

Yield, 11,864 lb. milk and 894·94 lb. butter in 365 days.

Sire, Kaid of Khartoum (949).

Dam, Wagga Larkspur.

PURE-BRED YOUNG BULLS of the following breeds—MILKING SHORTHORN, JERSEY, GUERNSEY, AYRSHIRE, and RED POLL—always available for Sale.

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To Combat Downy Mildew

All our years of experience in supplying sprayers have taught us that

THE AUTO SPRAY No. 15

is the vineyard sprayer that is most satisfactory in every way.

Its simplicity is a big feature. The horse supplies the power. The wheels are made fast to the axle so that as the horse moves the axle turns. A simple eccentric which drives the pump is attached to the axle. This drive is like the drive of a locomotive—positive in its action.

The Auto Spray No. 15 is also adaptable to vegetable or orchard spraying. It lasts a lifetime.

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More Profit from Eggs

A RADICAL CHANGE IN POULTRY FOOD VALUES

Learn all about "KARSWOOD"

THE discovery which has led to the manufacture of KARSWOOD POULTRY SPICE (containing ground insects) is of special interest to everyone who breeds and rears fowls, whether for pleasure or for profit. It has enabled poultry breeders and farmers to increase enormously the egg production of their birds, not only during the laying season **BUT FOR EVERY WEEK IN THE YEAR,** and particularly in winter time when eggs fetch the highest price.

KARSWOOD POULTRY SPICE (containing ground insects) is invaluable as an egg producer, **but it does not force the birds.** It is guaranteed not to contain Cayenne Pepper, Ginger, Gentian, Capsicum, Chillies, or other injurious ingredients. KARSWOOD POULTRY SPICE stimulates egg production by a natural development of the egg-cluster, and eggs resulting from its use are larger, richer in flavor, and much more fertile.

The results of a wonderful test of the egg producing claims of KARSWOOD POULTRY SPICE are given in full detail in "Poultry Newspaper," 11th June; "Australian Hen," 20th June; "Poultry Bulletin," 16th June; and "N.U.P.B.A. Gazette," 1st July.

KARSWOOD POULTRY SPICE (containing ground insects) costs little to use—a halfpenny a day to make 12 hens lay.

4d. packet	supplies	**12**	hens	for one week.
1/- ,,	,,	**20**	,,	16 days.
2/- ,,	,,	**20**	,,	32 days.
7lb. tin (14/-)	,,	**140**	,,	32 days.

If your Poultry Food Dealer or Grocer cannot supply KARSWOOD POULTRY SPICE, write for supplies to

Coastal Farmers' Co-operative Society Ltd.

WHOLESALE AGENTS FOR NEW SOUTH WALES. :: QUAY STREET, SYDNEY.

WHEN RABBITS ARE TROUBLESOME

USE THE

"SUDDETH"

Rabbit Fumigator and Smoker

Everyone who has used a "Suddeth" has a good word for it, because it gives results.

Over 6000 are giving satisfaction all over Australia.

Outside Australia the "Suddeth" can be found in

Canada
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Scotland (Gullane Golf Club).

What you require to beat the rabbits is—

	£	s.	d.
1 No. 2 Suddeth and Smoker	7	0	0
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1 Drum Carbon Bisulphide, 5 gallons...	2	18	0

CATALOGUE WILL BE POSTED ON REQUEST.

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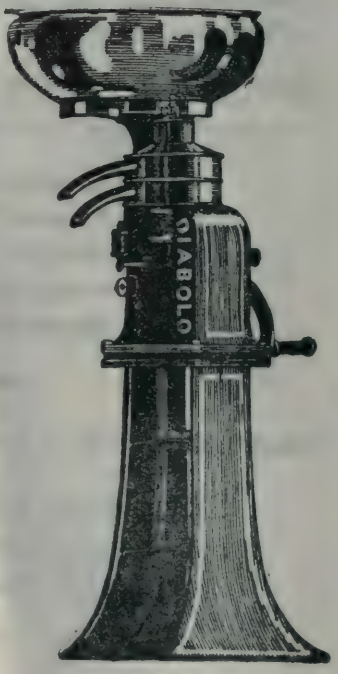
F. S. GREER, *Patentee and Manufacturer, 102 Sussex St., Sydney.*

How to make your cows return more money

There's one way only! Discard your old, worn, or wobbly separator. Buy a well-balanced machine that prevents cream loss—a machine that is easy to turn, easy to clean, a joy to own. Get a Diabolo separator.

The Diabolo Separator holds the highest award obtainable by any implement, the Gold Medal of the Royal Agricultural Society of London—a wonderful tribute to both its splendid construction and its close skimming character.



The perfect balance of the skimming bowl gets all the cream, and soon repays you for scrapping a hard-running, wasteful machine.

Enormous production by the world's greatest separator factory gives you a perfect separator at a low price. Why not write now for prices and all particulars.

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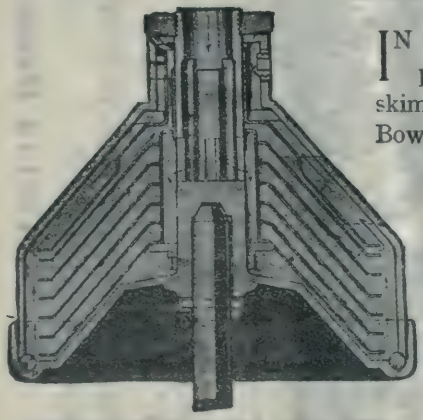
SHORTER HOURS ON THE FARM!

The "FORDSON" saves from 30 to 50 per cent. of the farmer's time.
The "FORDSON" does the work of six horses.
One man with a "FORDSON" can do more work easier than three operating in the old way.

LET US MAIL YOU DETAILS.

MOTOR TRACTORS LTD. :: :: 112-114 Hunter Street, SYDNEY.

The DOMO SEPARATOR



SECTIONAL VIEW OF THE DOMO BOWL, SHOWING A FEW DISCS.

IN any separator the first big proportion of butter fat is skimmed as soon as it enters the Bowl. But the smaller particles are often carried away with the skim milk.

The "**DOMO**" Self-balancing Bowl has unusually high skimming power at the outer edge in order to catch these tiny globules of butter fat.

At Murwillumbah recently a "**DOMO**" 105-gall. separator gave a ·00 test!

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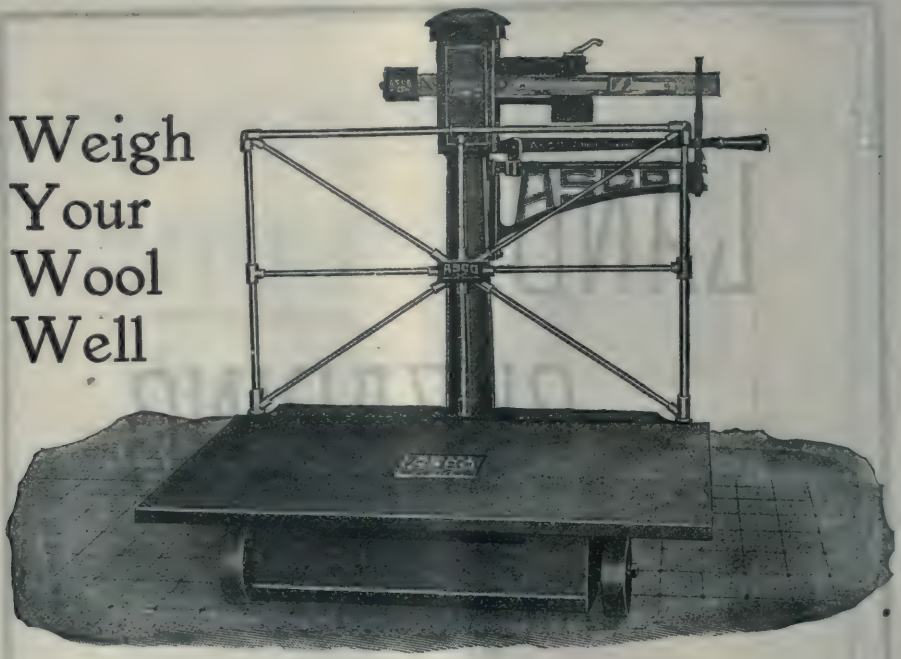

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5	—30 „ ...	13	0	0	„	10	8	0 ...	2	12	0
6	—33 „ ...	15	0	0	„	12	0	0 ...	3	0	0
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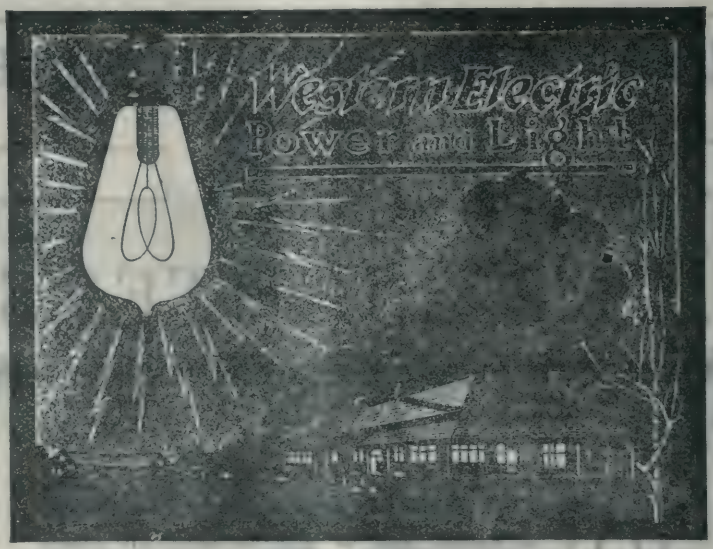

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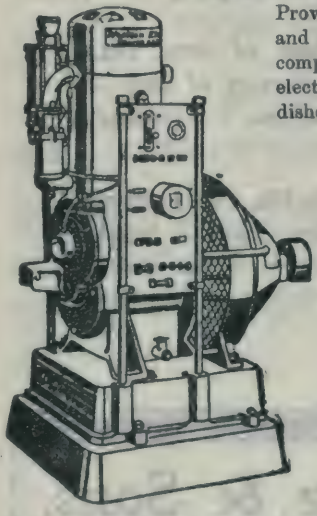

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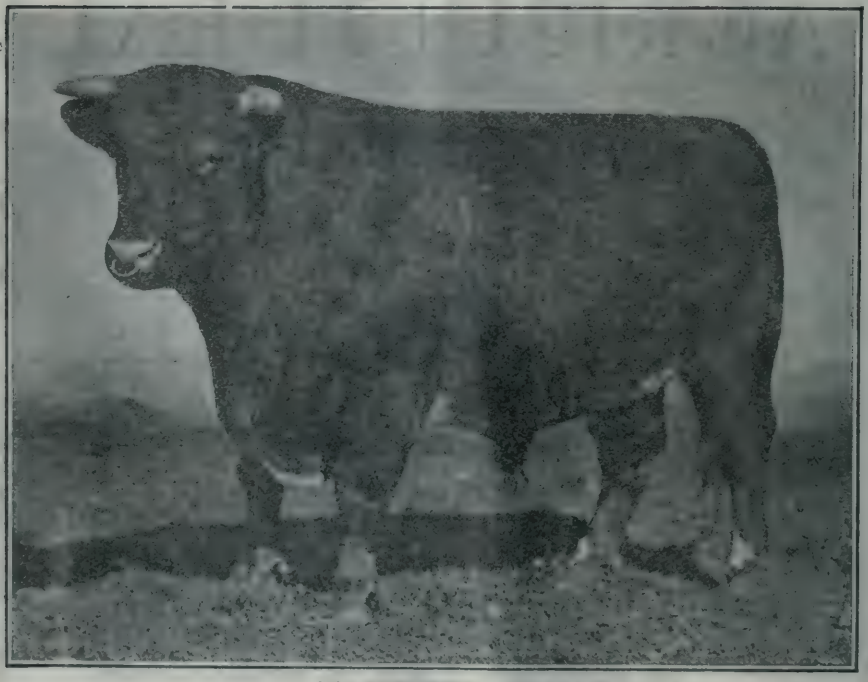

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2*nd July*, 1921.

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"POST ORBIT"—Grand Dam of "Prometheus" won in Butter Tests 4 First Prizes, 3 Gold Medals, 4 Second Prizes, and 2 Silver Medals, 3 Third Prizes and 2 Bronze Medals. In Milk Trials she won 4 First Prizes, 4 Second Prizes, R.H.C., H.C., at various Shows, 1906 to 1914. She yielded 93,994 lb. Milk in 9 years; average, 10,656 lb. per year. She also won 22 Prizes in classes, including 6 Firsts and 2 Blythwood Bowls. **His Sire's Dam** "Mrs. Viola" won E.J.C. Certificate of Merit in Butter Tests 1905, 1906, 1909, 1911; her average yield of Milk was 9,098 lb. per year for six years; she also won 6 Firsts and 1 Champion Prize, 1906 to 1911. **Sire's G. Dam** "Marigold XV" won in Butter Tests 3 Gold Medals and 3 First Prizes in Milking Trials, 1906 to 1910; her average milk was 9,448 lb per year for 12 years.

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VOL. XXXII. PART 7. JULY 2, 1921.

Agricultural Gazette of New South Wales.

457

Wheat-growing in New England.

R. H. GENNYS, Manager, Glen Innes Experiment Farm.

THE conditions governing the production of wheat on the Northern Tableland differ considerably from those in the rest of the State. The climate is cooler and the rainfall heavier and more reliable than elsewhere, while the soil is of a heavier nature and chiefly basaltic, though volcanic ironstone also occurs. The cooler temperatures necessitate the use of hay on a larger scale for the feeding of stock than in the warmer districts, and wheat is so suitable for this purpose that quite half the area sown to that cereal each year is cut for hay. Under the influence of changing conditions, however, there are indications that wheat for grain may in the future prove a larger factor in farming in this part of the State than formerly.

The New England farmer requires to select his soil with some care for the different crops. Good hay crops are obtainable on almost any class of soil, though the darker and richer soils are perhaps the best, but for grain such land should generally be avoided, and preference be given to the lighter and red coloured soils. It has been observed that the head does not always fill well on the heavy soils; very heavy yields of straw are obtainable, but even in the shorter crops the heads do not always fill well.

In one respect the New England farmer enjoys a distinct advantage over his western compeer—he can adopt a rotation of crops that is profitable at each course, and yet practically complete. The western grower is distinctly limited in the matter of profitable crops that can be alternated with wheat, but the New England farmer can adopt a rotation that in four years provides three grain crops, a fodder crop, and a fallow. The course consists of :—

Maize or Potatoes—sown in October or November; harvested in June.

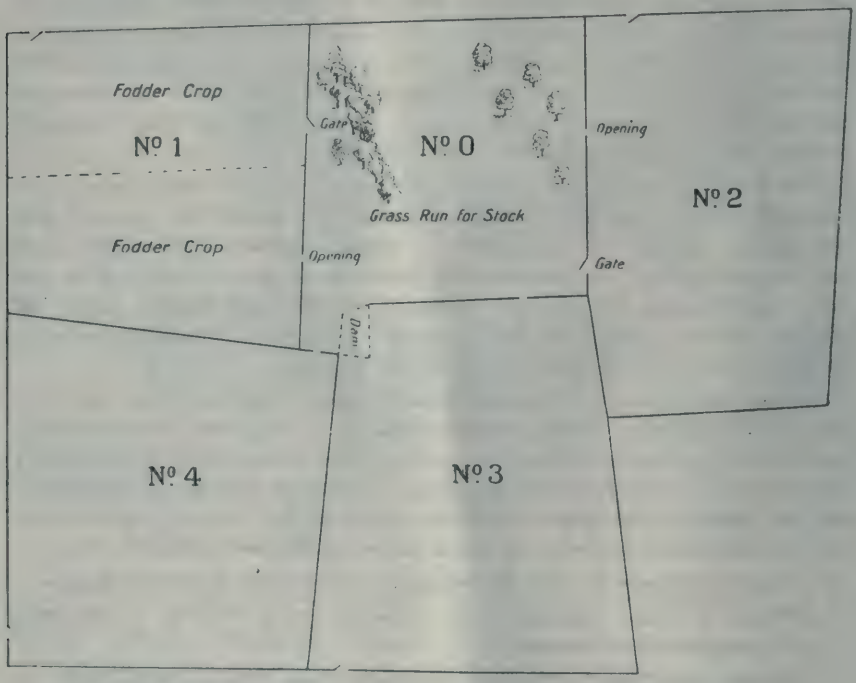
Wheat or Oats (quick-growing variety)—sown in July or August; harvested in December.

Fodder crop (rape or turnips in combination with a cereal, sown in February; or clover with an annual or biennial grass, sown in March or April); fed off with sheep, residue ploughed under in early summer.

Wheat or Oats (slow-growing variety)—sown in April; or medium slow-growing variety—sown in May or June; harvested in December; land fallowed in January or February in view of sowing maize or potatoes in the following spring.

Such a rotation carries its own recommendations, there being a sufficient variety of crops to maintain fertility, as well as provision for a flock of sheep on the farm. It should not be necessary in these days to commend to a wheat-grower the value of a flock of sheep. In every part of the State it is found that the combination is an invaluable one, and New England is no

exception. Some of the best crops obtained on Glen Innes Experiment Farm have followed the fodder crop, but sheep also turn weeds, self-sown wheat and stubble to account, and enable the farmer to make money out of what would otherwise be a source of trouble and expense. The accompanying diagram gives some idea of how, taking advantage of natural conditions, the paddocks are arranged for the rotation at Glen Innes Experiment Farm. It will be seen that the paddock No. 0 contains a dam to which access can be had from all the paddocks in the rotation area. Several acres of red gum scrub near the water afford protection for the stock from wind and rain in winter, and from the heat of the sun in summer. Suitable licks are



Plan showing the arrangement of Rotation Paddocks at Glen Innes Experiment Farm.

[The dotted line across No. 1 Paddock indicates a temporary fence.]

always available in the timber, and generally a straw stack for the stock to pull at; in lean seasons these stacks are invaluable, and even when succulent fodder is available they help to balance the ration.

The practice on this farm is to clear the maize stalks off, and plough the land at once, so as to get it into condition and enable the seed to be sown as soon as possible. It goes without saying that to sow wheat immediately maize stalks are removed would be impracticable in other districts, as the ground would be quickly dried out. The moisture conditions of New England enable it to be done, however, and done profitably.

The depth of ploughing for this sowing is usually 4 inches, and a method of preparing the seed-bed must necessarily be adopted that will conserve to the maximum the moisture left in the soil by the maize. Necessarily it is July or August before the wheat can be sown, but it is not too late for the district. As a matter of fact, visitors from other parts of the State are often surprised to see crops being sown on these tablelands as late as the beginning of September—a time when the coastal crops are ready for cutting, and when western crops are regarded as approaching maturity.

An early maturing variety of wheat must be used. Thew has been tried, but with only a fair amount of success on the Experiment Farm, and with farmers who are sowing late wheat crops in this district, Florence is becoming a great favourite. Any grower who is disposed to try some other variety should avoid rust-liable wheats, and all seed should be treated with bluestone solution as a preventive of bunt. Sometimes oats are sown instead, and then such a short-season variety as Sunrise or Guyra is used. Occasionally White Tartarian is sown, for though slower in maturing it is more adapted to late harvesting, and is cut in January or even in February

This late-sown cereal crop is used very much as the season directs. It is not so certain as the early sown crop, and it has more often to be cut for hay than for grain, but in some seasons excellent grain crops have been harvested.

This cereal crop is followed, as indicated above, by a fodder crop sown in the early part of the fall. Rape or turnips, sown alone or in alternate drills with a good stooling variety of wheat or oats, or perhaps with Cape barley, may be planted in February; another useful combination according to our experience on this farm, and of other farmers in the district, is red clover, in combination with Italian rye grass or some other annual or biennial grass; the seed is sown in March or April. The fodder crops are fed off through the winter, the sheep being turned in once, twice or more often as the growth permits, and if possible, some growth is left to be turned under with the residues in the early summer.

This gives a short period of fallow before the sowing of the long-season cereal crop of the rotation. Any weeds or other growth that appear are fed off prior to a second ploughing, about the early part of April.

The first ploughing, when the fodder crop residues are turned under, is usually a deep one—about 5 inches—while the second ploughing is a little shallower—not exceeding 4 inches. The sowing of the wheat immediately follows this second ploughing, a long-season or slow-growing variety being used. Haynes' Blue Stem is sown on the earliest paddocks, but Genoa has also done well on the farm if sown a little later. For New England conditions, in fact, Genoa may be considered a mid-season to late wheat, whereas Haynes' Blue Stem is a very late variety.

The last-named variety has been a useful one locally, but it may shortly be superseded by one of several varieties of long-season wheats that are now attracting attention in the experimental area. Though producing a very

bulky crop for hay, Haynes' Blue Stem has the fault that the chaff is so light as to necessitate the use of too many bags to the ton; moreover, the grain shells too freely.

While some of the Manitoba and other Fife wheats, such as Power's Fife and Marquis, have yielded well at times, here it has been found that, notwithstanding that they may be very strong when imported, the grain quickly deteriorates under local conditions, and in a few years their flour strength is no better—and sometimes worse—than the local varieties. Some imported varieties are uncertain yielders, for in some years they fill well and yield heavily, while in other seasons, without any discovered cause, large patches of the crops fail to set grain. Marquis gave good yields of hay and grain last season, and will be sown again this year in the commercial area. Rust-liable varieties, of course, will always have to be avoided.

The early-sown cereal crops are more certain than the late-sown crops that follow maize. In a dry season they have the advantage of a certain amount of moisture conserved in the soil by the short fallow, while in a wet season they are apt to make such heavy growth as to go down. The best grain returns are obtained from these early-sown crops, but good hay crops are also obtained from them. It will be seen that the farmer is practically assured of a profitable crop whatever the season may be.

The seed, which should be "bluestoned," is generally planted about 2 inches deep with the disc drill; on the whole, in this somewhat moist district, it can be a bit shallower than in very warm districts. The quantity of seed used varies with the time of sowing, and may be best indicated in the following table:—

	April.	May.	June.	July.	August
	lb.	lb.	lb.	lb.	lb.
Haynes' Blue Stem ...	50–60	60–70	...	...	...
Genoa	...	70–75	70–75	...	...
Marquis	..	70–75	70–75	...	...
Florence	...	...	70–75	80	90

In all cases, if the crops are expressly intended for hay, the sowing should be a little heavier. As a rule it is not advisable under New England conditions to feed-off wheat, unless very prolific growth occurs early in the season.

Methods of Harvesting.

The methods of harvesting grain in New England are very different from those of the drier western districts. The straw is too tough to strip as the wheat of the west is stripped, and moreover, it is invaluable as feed for stock during the winter, and the dry spells that occur from time to time. Even dry stock have to be fed during such times, and the straw must be saved or losses are likely to be heavy. Thousands of livestock were lost in the last drought which could have been saved had the supply of straw been larger, and those farmers fared best who had kept stacks of straw and hay beyond all seemingly probable requirements.

The soil, too, is not even enough in quality for the stripper or combined harvester, and some patches ripen earlier than others, while heavy dews would often prevent operations until late in the day.

Hence it comes about that it is the older machinery—the reaper and binder and the threshing machine—that are used to deal with the grain crop, and though it must be admitted that the operation is a more costly one than highly specialised machinery has made it in the west, the larger yields and the greater value of the straw, make it worth while.

Taking the average season, wheat grown in New England will never have the milling quality of that raised in the drier districts, but there are not lacking indications that a larger area will be devoted to the crop in the future, and probably (as varieties and methods improve) with a wider margin in favour of the grower, and certainly with higher yields than the average of the State.

The stage at which wheat is cut is of considerable importance. The quicker grain ripens the better the flour strength: slow ripening produces a soft wheat of reduced value for milling purposes. Under New England conditions, cutting with reaper and binder, and allowing the grain to mature in the stook before threshing, actually aids the production of a better quality grain. It is preferred on this farm to cut the wheat in the dough stage, and allow it to "make" or mature in the stook, or the result is a far better milling wheat and an attractive translucent grain. Cutting with the reaper and binder actually favours some varieties of wheat. In other districts, for instance, Florence shells readily, because it has to be kept until it is dry enough to strip. At Glen Innes, on the other hand, it can be cut at a stage when it still holds its grain well, and allowed to mature in the stook, with the result that it yields very well. Others also of the varieties successfully grown in New England are liable to shell if left until dry enough to strip.

Bleaching is largely prevented by cutting with the reaper and binder, for wheat that is left until ready for the stripper is much more likely to be damaged in this respect.

The straw also is of much better quality when cut with the reaper and binder, for when ready for stripping it has become little more than fibre, whereas cut at an earlier stage it still has a good deal of nutriment in it, and is accordingly better feed for stock.

Four essentials to successful wheat-farming in New England may be mentioned:—1. Suitable soils; 2. Suitable varieties; 3. Sowing at proper times; 4. Cutting the crop at the right stage.

The Cost of Production.

In presenting the following estimate of the cost of producing an acre of wheat under New England conditions, it may be pointed out that it is based on the experience of Glen Innes Experiment Farm and of farmers generally in the district.

Costs have not advanced in recent years in this district so much as in some other parts of the State. One or two factors of a specific kind have been

responsible for this. Ploughing, once done in New England with heavy single-furrow or double-furrow implements, is now being done with four-furrow implements on many farms. In part, this is due to the implements used being of lighter construction than formerly. Time was when a two-furrow plough was a very heavy thing indeed, and farmers hesitated to try a four-furrow one, but to-day better and lighter models of four-furrow implements hardly involve any more horse power, and farmers are more disposed to use them. Stump-jump ploughs are preferred in stony paddocks.

The depth considered essential to best results is also less than it used to be. It is now found that nothing is gained by ploughing too deep on the heavy clay soils of the tablelands. In other words, the use of better implements and methods has almost kept pace with the increase in the cost of labour in ploughing.

ESTIMATED cost of producing an acre of wheat for grain in New England—Estimated yield, 20 bushels.

	£	s.	d.
Ploughing, once (land previously under cultivation) ...	0	7	6
Harrowing, twice at 1s. 4d. per acre	0	2	8
Drilling	0	2	0
Seed, 75 lb. at 7s. 6d. bushel	0	9	4
Superphosphate, ½ cwt. at 7s. cwt....	0	3	6
Pickling seed at 4d. per bushel ; 1¼ bushels per acre ...	0	0	5
Cutting with binder	0	3	2
Twine, 5 lb. per acre at 8¼d. lb.	0	3	6
Stooking for grain	0	4	3
Carting and stacking	0	11	8
Bags, seven at 8s. per doz.	0	4	8
Threshing at 2s. per bag	0	14	0
Total cost of growing and harvesting...	3	6	8
Rent, one year	0	10	0
Cartage to rail, 5 miles distant, at 5s. per ton	0	2	10
General depreciation, and interest charges on horses and plant	0	4	10
Total cost of 20-bushel crop...	£4	4	4

The above is based on an 8-hour day. For the crop that follows maize one ploughing is sufficient ; but for the long-season crop following the fodder crop two ploughings are usual, and the additional ploughing would cost an extra 6s. 6d., being more easily and quickly accomplished than the first ploughing.

For hay, we like to cut the wheat in the flowering or early grain stage. No grain, or only shrivelled grain, is preferred to fully matured grain in a sample of hay chaff. As the object is to get stock to eat the whole plant, it is well to cut the crop when the nutriment is best distributed throughout the plant and when palatability is also greatest, and these things are both secured by cutting at the stage indicated.

In harvesting hay for chaffing purposes in the New England district special care is necessary in stooking the sheaves. The method adopted on the farm is to set up four sheaves in each stook (two and two in a diamond) and then tie them together with a band of hay. A good spread is given to

the sheaves at the bottom to enable them to dry quickly and to prevent them from being blown over. The cost of stooking for hay and chaff is a little greater than for grain.

Throughout the district, the stacks built are all round ones, and if well made they require no thatching, and will throw any water off.

ESTIMATED cost of producing an acre of wheat for chaff in New England—Estimated yield, 2 tons.

	£	s.	d.
Ploughing, once (land previously under cultivation) ...	0	7	6
Harrowing, twice, at 1s. 4d. per acre	0	2	8
Drilling	0	2	0
Seed, 90 lb. at 7s. 6d. per bushel	0	11	3
Superphosphate, ½ cwt. at 7s. per cwt.	0	3	6
Pickling seed at 4d. per bushel, 1½ bushels per acre ...	0	0	6
Cutting with binder	0	3	2
Twine, 5 lb. per acre at 8¼d. lb.	0	3	6
Stooking for hay	0	5	8
Carting and stacking	0	11	8
Cutting for chaff, 2 tons at 12s. per ton	1	4	0
Bags, 2 doz. per ton, at 8s. per doz.	1	12	0
Total cost of growing, harvesting, and chaffing ...	5	7	5
Rent, one year	0	10	0
Cartage to rail, 5 miles distant, at 5s. per ton	0	10	0
General depreciation, and interest charges on horses and plant	0	4	10
Total cost of 2-ton crop	£6	12	3

THE BREAKING STRAIN OF TIMBERS.

THE following table compares the breaking strain of Australian hardwoods with American white pine:—

	Weight per cubic feet.	Breaking stress in lb. per square inch.
Pine	54·31	15·901
Red Ironbark ...	76·52	19·609
Grey Box	73·62	22·415
Cypress Pine ...	50·00	4·359

—A. BROOKS, Works Overseer.

SALE OF MERINO FLOCK RAMS.

AN auction sale of Merino flock rams will take place at Nyngan Experiment Farm on Wednesday, 20th July, when 110 rams will be offered in pens of five, together with a few of the better class selected rams, which will be offered in single lots. The animals will be available for inspection on the morning of the day of the sale.

Further particulars are obtainable on application to the Manager, Experiment Farm, Nyngan; the Under Secretary and Director, Department of Agriculture, Sydney; or Messrs. Smith and Holmes, Auctioneers, Nyngan.

On 20th July the Sheep and Wool Expert will give a demonstration of wool-rolling, piece-picking, skirting, and wool-classing.

Hay that Caused Skin Irritation.

During the months of April and May men who were handling and chaffing wheat at Grafton Experiment Farm suffered severely from irritation and skin rashes, which spread over the body, forming white blisters. In a measure the trouble was controlled by the men wearing dungaree coats and wrapping handkerchiefs around their necks and tying the sleeves on their arms. Various ointments were tried, but none appeared to prevent the irritation and the skin eruption.

Sheaves of the wheat were sent to Sydney by the Manager, Mr. G. Marks, and were examined by Mr. W. W. Froggatt, Government Entomologist, who found very dark coloured grain weevils and a small moth present, but none that would have the irritating effect described. It was considered, however, that the irritation was probably caused by a small harvest mite that at times is very common in hay. This tiny creature punctures the skin and sets up intense irritation. None of these were found in the sheaves, but they might easily have dropped out during the knocking about on the journey.

With regard to preventive measures, Mr. A. H. E. McDonald, Chief Inspector of Agriculture, suggested that perhaps the trouble could be reduced by steaming the hay. Steaming is commonly done in western districts to reduce the brittleness of the straw and improve the quality of the chaff. The steam might not kill the mites, but it would perhaps prevent them from biting. In the absence of the tunnel used in the west for the steaming process, the sheaves might be thrown into small heaps and the steam turned on, or it might even be injected into the surface of the stack.

The Fashioning of Horns of Stud Cattle.

The Department was asked lately about the practice of training the horns of stud or show cattle. The reply was that in some cases it becomes a vice, and the purchaser is often led to believe that he is buying a typical animal, with the result that his herd may be spoiled so far as the type of the head is concerned.

The Stud Book allows a fairly wide range in regard to the horns, and if breeders cannot produce the type by breeding and selection, amendments should be made to the scale of points. It is wrong, and it seriously affects a breed to judge it by any feature that has to be artificially produced and that cannot be handed down to the offspring. The neat periwinkle-shaped horn produced in some breeds by the aid of the file, saw, heat, tension, weights and dubbing, was originally a straight steer-like appendage. Excessive training of horns should be a disqualification.

Where stud animals are purchased with typical horns not artificially produced, no trouble should be experienced in this respect if the following precautions are adopted:– (1) Correct feeding of the young stock; both over and under feeding produce variations in the horns. (2) Protection from injury while feeding, &c. (3) Where through injury a slight deviation from the normal occurs, a little pressure or weight or some other simple method will correct it. J. A. Robertson, Herdmaster.

Producing Lucerne Hay under Irrigation Conditions.

Methods and Experiences at Yanco Experiment Farm.

[Continued from page 390.]

F. G. CHOMLEY, Manager, and F. CHAFFEY, Farm Foreman.

Making the Check Banks.

The method of irrigation adopted is flooding, but flooding over limited areas, and between check banks that run down the field in the direction of the fall. The formation of these check banks is the next operation. They are placed half a chain apart and are formed by throwing two furrows together with a single-furrow plough. The soil is then filled into the furrow with a road grader to which is attached a long blade made on the farm, so that the soil is levelled and the banks strengthened. The preservation of these banks throughout the life of the lucerne stand is essential, for they are a most important feature in thorough and efficient application of the water Hence, on account of these banks, as well as the preservation of a level surface between them, all subsequent work must be in the same direction—that is, from head ditch to drain. The ends of the checks have to be finished off by hand, as the road-making or levelling machine referred to will not work right to the end of the paddock.

It is most essential that the blocks should not be too long; in other words, the distance between the head ditch and the drain at the lower end should not be more than 6 or 7 chains. At that length the levels can be easily obtained, and an even flow of water from the upper end to the lower assured, but longer blocks are irrigated with difficulty. On a block made 15 chains long some years ago, it was found that the upper end of the lucerne had got too much water before the lower end had got any at all.

The drain along the lower end of the paddock is quite essential, as every irrigationist well knows. Stagnant water is a thing not to be tolerated on a well-managed irrigation farm; hence, drainage must be provided as a concomitant of the head ditch, or damage will certainly occur.

Working the Seed-bed.

In April the land thus prepared for sowing is treated to an application of water. No doubt some will wonder, but so it is. It is found that if the soil (already warm and well worked) is also moist, the seed germinates quickly and also evenly. Sowing in a dry seed-bed has been one of the common causes of failure on the irrigation areas. In such cases the seed is sown with the intention that the ground shall be irrigated after sowing (perhaps, too, with the hope that rain will make irrigation unnecessary), but the

method is rarely satisfactory. In many cases the effect of the irrigation water is to cake the surface over the tender little seedlings, which are therefore unable to reach the sun and air. Does it need to be pointed out that to attempt to disturb the surface at that stage is almost as fatal to the little plants as to leave it alone? The lucerne seedling is a very tender thing indeed, and disturbance in its early life is one thing it takes as most unkind. All cultivation of lucerne must be after the plant is well rooted—and to sow the seed in a dry seed-bed is simply sowing a crop of troubles. One grower who tried this method had a novel experience; the water floated the seed off the higher portion of the ground and deposited it on the lower, giving him half his area much too thick and the rest much too thin.

How we obtained a moist seed-bed, let us explain. In April the land is furrowed out between the check banks with special furrowing shovels attached to an ordinary cultivator. These shovel points, which really belong to the Planet Jr. type of fittings, make the furrows 2 feet apart, which means three or four of the points on the cultivator. The water is then turned into these furrows from the head ditch, and the land thoroughly saturated; the water is confined to the furrows as much as possible, and it advances slowly along the furrows, soaking downwards and laterally, and giving a far better result than would be obtained by flooding between the check banks without furrows. It takes the water three or four days to reach the lower end, but the furrows are not allowed to overflow.

Forming the Check Banks—the first furrow.

Should the land have been fouled with weeds, it would be well, perhaps, to forego (in part) the advantages of the fallow period, and to form the check banks and furrows earlier in the year, turn in the water to germinate the weed seeds, and kill them by cultivation. A further irrigation in view of the sowing of the lucerne will probably then be necessary, according to the state of the ground when the beginning of April arrives.

The Sowing.

The land being thus well irrigated, as soon as the surface is dry enough to carry the teams, the tine cultivator is employed to produce a level and fine surface. The seed-bed is now in an ideal condition, and the seed is sown at once, the drill being generally no more than half a day behind the cultivator. If by any mischance the ground unfortunately dries out before the seed can be sown, it is better to cultivate and irrigate again before sowing

rather than to attempt to do any good on the dried out surface. If, for any other reason, the seed fails to germinate after treatment on these lines, it is better to leave the whole thing until next year, and to use the paddock in some other way in the meantime.

The seed used on the farm is obtained from Tamworth, that being the only seed now sown for farm crops. Many varieties and sub-varieties have been sown, but Tamworth Broadleaf lucerne has given far better results than any other.

For the sowing, the grass-seed attachment of the ordinary wheat drill is used, the seed being fed at the rate of 10 lb. of seed per acre through all the tubes into the main hoes of the drill. Some farmers use the drill but sow

The Road Grader, showing the wide board, 19 feet long, which replaces the steel board for check-bank making.

broadcast, leaving the tubes out of the hoes; the results are seldom so satisfactory as when the seed is put down into the soil with the aid of the hoes (withal, of course, not too deeply). Let it be remembered in what a prime condition the soil now is, and all that is required to ensure good germination is to place the seed down on the moist soil. The soil warmth and the moisture will do the rest.

To ensure a sowing 1½ inches to 2 inches below the surface, the drill is set in the first notch; the soils on this farm, as already stated, are stiff, and this is necessary under such conditions. Where the soil is a fine loam, the hoes could run free, and not in the notch at all, and the weight of the hoe would be sufficient to sow the seed deep enough. When sowing the headlands where the horses have trampled down the surface, our practice is to put the drill in the second notch in order that the seed may be sown at the right depth. The principal thing is to ensure that the seed is put down on the moisture and to work the drill to that end.

Superphosphate is sown through the manure box of the drill at the same time as the seed, 56 lb. per acre being applied. The manure is also sent down the hoes of the drill, so that it may be deposited close to the seed where

The Road Grader at work. A light cut only is taken and two trips made on each side of the bank so as to move just sufficient top-soil to fill in the furrow and strengthen the check bank.

Furrowing out with special shovels on the cultivator for irrigating.

it can be made use of at once. Superphosphate has a distinct value in relation to lucerne, having given better results under our conditions than any other fertiliser. The top-dressing of lucerne stands in the winter or spring

has given marked results and should become part of the farm practice of growers in almost every part of the State, but in connection with the establishment of a stand it also has a definite utility.

Irrigation by furrows previous to cultivating and sowing.

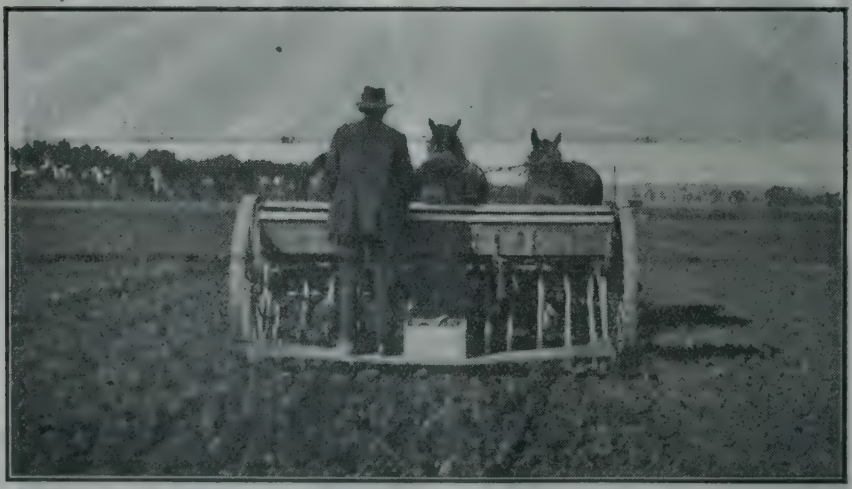
Cultivating the surface after irrigating and before sowing.

We now have our lucerne seed in the ground, and under conditions that could hardly be improved upon. The last farm operations—the furrowing, irrigating, and sowing—have been accomplished within a few days; the soil

is still warm and it is thoroughly moist. Amid such favourable surroundings the lucerne seed—hard though it is, and lucerne seed has a very hard exterior that requires a good deal of moisture to soften it—usually germinates within four days and the rows can be clearly seen in ten days.

Handling the Young Stand.

The seedling lucerne plants are thus up by the early part of May and winter showers keep it growing slowly until the spring. As already stated, young lucerne does not care for cultivation, and nothing of the kind is attempted here, with the possible exception (under very adverse circumstances) of running a light seeding harrow over the crop with the tines sloping backwards. The plant is delicate and will not stand being disturbed at this stage, though it will resist drought surprisingly. Indeed, more young lucerne plants are killed by too much water than by too much dry weather, for lucerne is distinctly hardy in respect to the latter.



Drilling-in lucerne seed : this operation follows immediately after cultivating.

In the spring—about September—it is advisable to run the mower over the ground and to allow the very light cutting to remain on the ground; the same may have to be done again in October, though it may be possible with a good stand to let the second growth go for a light hay crop. The plants must be encouraged to stool at this stage, however, and cutting is valuable to that end. The growth must be watched at this stage with care, for (as with most other plants) as soon as the conditions become a bit adverse there is an impulse to preserve the species by setting seed—an occurrence that cannot but exhaust the plant and permanently affect its vigour.

Perhaps in November a cut worth saving as hay will be obtained, and by that time an application of water will most probably be necessary. It is one of the disadvantages of spring sowing that before the plant has attained

any height it may be necessary to apply water, which in turn makes a light harrowing a necessity in order to loosen the surface and let the little plants grow. Such a disturbance is never in favour of the plant, but in such circumstances it may be unavoidable. Sometimes, if the surface has become set, it is possible to give a very light watering and then to run an ordinary tine harrow over the ground.

(*To be continued.*)

Field Notes on *Goniozus antipodium*.

This little hymenopterous parasite is a well-known enemy of the codlin moth, but I have lately found it also attacking the grub of the peach-tip moth. It was described by Mr. W. W. Froggatt, Government Entomologist, in his paper "Codlin Moth Parasites" in the pages of this journal in 1906, and he has identified specimens I lately bred out at Epping.

I had noticed that the peach-tip moth had been infesting quinces in the latter part of the season 1920–21, and I placed bandages on four quince trees. On 18th March, as I was removing one of these bandages, I found one peach-tip grub with seven small yellow wasp larvæ hanging to its sides, sucking all the juices out of it. On another I found four, and on several others from two to four. Two specimens of the adult wasp were also found right inside the cocoons of the grubs, and on one grub there were three freshly laid eggs. These were put away for development, and on 12th April, eight fine healthy adult specimens could be seen flying around the jar. A supply of fresh grubs was put in, and on the following day I watched a female wasp deposit an egg on a grub on which she had previously laid four. Later on, on 19th April, nine young larvæ could be counted on one grub, four on another, and three on another, and a number of freshly laid eggs. Altogether they appeared to be quite happy in their captive state. They moved about quickly, and did not appear at all shy. On 15th June nine of the wasps bred in captivity were still alive and healthy, though there were no signs of eggs: one was then inside a grub cocoon.

Goniozus antipodium is a small black ant-like wasp, about one-eighth of an inch in length, with the abdomen thick at the base and tapering off to a sharp point. The eggs are oblong, clear and glassy, but so small that they can scarcely be detected with the naked eye. The larvæ are small yellow, pear-shaped creatures. The cocoons of the pupæ are of white silk, rather loosely spun, and are attached to the bandage or bark of the tree close to the empty skin of the host. They are not internal parasites. The eggs are laid on the outside of the host, the tiny larvæ thrust their suckers into the sides of the grub, and there hang until they have sucked all the juices. Then they spin their cocoons close by, and await their development.

From two bandages taken from quince trees in another orchard on 11th March, containing about sixty-four peach-tip grubs, I bred nineteen striped wasps, *Gambus stokesi* (internal parasites), sixteen black wasps, *Goniozus antipodium* (external parasites), one black wasp (*Proctrotrypid* sp.), and six peach-tip moths. Two peach-tip moth grubs had dried up, and eighteen remained in the larval state. From bandages containing codlin grubs only I did not get any of these wasps, but I noticed that they laid a number of eggs on a codlin grub that was put in the jar.—L. Gallard, Fruit Inspector.

Fumigating Maize with Carbon Dioxide.

Shelled maize may be protected from weevil with carbon bisulphide (as described in the *Agricultural Gazette*, October, 1920), or with carbon dioxide gas. If the latter is preferred, the maize should be placed in an ordinary galvanised-iron tank, and the gas passed slowly in by means of a rubber tube connected with the tap hole of an ordinary cylinder of carbon dioxide gas, such as is easily procurable from various firms. The cylinder should be placed on an ordinary weighing machine, and the weight noted, and then 1 lb. of gas allowed to flow into the tank for every 12 bushels of grain. The contents of the tank can be estimated at 12 bushels of grain to 100-gallons capacity, so that a 500-gallon tank will hold twenty bags (60 bushels) of shelled maize, and therefore (whether full or not) should have 5 lb. of gas. The lid of the tank can be left off, as the carbon dioxide gas is heavier than air, and if it is admitted slowly (at the rate of 1 lb. in three minutes) it will push the air up and out of the manhole as it sinks to the bottom. A lighted candle held in the tank above the grain should go out for lack of oxygen. When sufficient gas has been admitted the tube should be withdrawn, and the lid put in place on the tank, with a rubber ring or a sack under it to prevent the gas from escaping. Any weevils or grubs present will die within about seven days.

The maize may be kept in these fumes for over a year without being affected for either seed or food and without developing weevils. At Grafton Experiment Farm maize has been so stored for eighteen months. The gas is quite harmless and non-explosive, and costs 6d. per lb.

The carbon bisulphide is probably less trouble, and though inflammable and explosive, can be handled with safety provided care is used and no light or fire or lighted cigarette or pipe is allowed near it. The maize must be fairly dry before being placed in a sealed tank, or it will deteriorate.—W. W. Froggatt, Government Entomologist.

Cattle Improvement in Denmark.

In Denmark the trend of cattle breeding is mainly to increase the number of dairy cows and improve their quality. This is evident from the fact that the number of milch cows was almost doubled in the last half century, and that in 1914 they constituted about 54 per cent. of the total cattle population of the country. The average milk yield, which in 1861 was only 220 gallons per cow, was increased until in 1914—the latest normal year—it had reached 605 gallons per cow. During the same period the butter-fat yield was increased from about 70 lb. to 240 lb. per cow. . . . . What is responsible for the production of the high grade milk-producing machines which the cows . . . . . have now become?

Better feeding and more comfortable housing have contributed, but the main cause has been the ruthless elimination of all "bad animals," both male and female. In Denmark a "good" cow means not only a sound healthy animal, but an animal giving a high yield of butter-fat; and similarly a "good" bull must not only be the son of a "good" cow, but must be capable of transmitting to his progeny the qualities of his line.—*Journal* of the Department of Agriculture for Ireland.

Farmers' Experiment Plots.

Potato Trials, 1920–21.

Lower North Coast.

J. M. PITT, Assistant Inspector of Agriculture.

Potato trials were conducted by the Department in co-operation with the following farmers during the season 1920–21 :—

J. G. Ward, Sherwood, Macleay River.
F. Kemp, West Kempsey, Macleay River.
J. W. Smith, "Hazeldean," Wauchope, Hastings River.
A. Longworth, Ghinni-Ghinni, Lower Manning River.
J. P. Mooney, Dumaresque Island, Taree.
R. Dyball, junior, Taree Estate, Manning River.
Singleton and Poole, Mondrook, Manning River.
Thos. Hoad, Mount George, Upper Manning River.
J. C. Duff, Mount George, Upper Manning River.
Alex. Smith and Atkins Bros., Bandon Grove, Williams River.
M. Smith, "Bona Vista," Paterson River.
W. Read, Wallalong, Hunter River.
J. G. Perrett, Miller's Forest, Hunter River.

In the Macleay and Hastings districts August was rather dry, but ample rain fell during the remaining months of the growing period. At Sherwood a hailstorm of more than ordinary severity for October severely damaged the crop, a great many of the stalks being either severed or broken.

Along the Manning the early growing months were also on the dry side, but rain fell in sufficient quantities from November onwards. Westerly winds were prevalent during August and September. The plot at Taree Estate, sown during a high wind, suffered in consequence, germination being affected by the dry seed-bed; and, as dry weather followed, many sets rotted.

Further south, in the districts along the Hunter and its tributaries, the season began wet but became drier towards flowering time, resulting in moderate to poor yields.

Rainfall, where available, in points

Months.	Macleay.		Manning District.			Hunter and Tributaries.			
	Sherwood	Kempsey.	Taree for Dumaresque Island	Taree Estate, Mondrook.	Mt. George.	Wallalong.	Bandon Grove.	Paterson.	Miller's Forest.
	pts.	pts.	pts.	pts.	pts.	pts.	pts.	pts.	pts.
August ...	18	41	16	10	65	96	...	...	107
September ...	256	292	127	122	148	149	381	137	238
October ...	365	282	161	75	156	54	97	52	50
November ...	213	419	315	225	236	258	85	267	247
December ...	217	273	452	433	489	...	825	1,511	...

The advice given in previous years as to the preparation of a good moist seed-bed cannot be repeated too often. To ensure a reserve of moisture and plant food in the soil one cannot start the preparation of the plot too early. Many farmers speak adversely of the advantages of even a short fallowing, regarding it as a waste of time and land. For maximum yields—and a farmer should aim at nothing less nowadays, since the prices of seed, labour, &c., have advanced to such an extent—half measures should be eliminated.

Cropping with the same class of crop is too much in evidence. Maize, cowpeas, field peas, pumpkins, &c., are all good crops to use in rotation. Overdoing the use of the plough is quite unnecessary, even on the dirtiest of lands. In one instance the land was ploughed four times after the harvesting of the autumn crop.

On the average alluvial soil that is not liable to run together, a deep ploughing in the autumn that will turn under stalks, rubbish, &c., followed by a discing or two before sowing time (or a shallow ploughing should a disc be unavailable), and a harrowing or two, usually suffices to ensure a good seed-bed and a reserve of moisture, plant food, &c. The plough often brings fresh supplies of weed seeds to the surface to germinate, whereas the disc works only in the surface few inches.

Cultural Notes.

Sherwood.—Medium loam; fallowed 1918–19; cowpeas in 1919 (fed off). Ploughed deeply in early autumn and again in May; disced before sowing; seed-bed excellent; sets ploughed in on 19th August. Plot badly affected by hailstorm; ladybirds fairly numerous.

West Kempsey.—Stiff loamy soils, new land, four years under pasture. Lightly ploughed in June; harrowed twice and rolled; deeply disc-ploughed in July; harrowed three times and rolled; disc-ploughed in August, and broken into good tilth with harrow and roller; drilled in on 13th to 18th August. Plot neglected during first few weeks after germination; hard surface, conducive to attacks of blight under the weather conditions prevailing; few ladybirds present.

Wauchope.—Rich loamy soil; newly broken. Ploughed shallow; disced three times; harrowed; twice disc-harrowed again, and twice harrowed; seed-bed somewhat grassy. Sets sown on 10th August in drills; a few ladybirds present.

Ghinni-Ghinni.—Loamy soil. Disc ploughed; rolled; harrowed; cross-disced; harrowed twice; again ploughed and harrowed; seed-bed good, but rather dry. Sown on 2nd September. Dry months following planting caused spindly growths in the open soil.

Dumaresque Island.—Extremely rich loamy soil; previous crop maize. Ploughed and worked three times; seed-bed in splendid tilth; rows 2 feet 6 inches apart; sets 10 inches apart (in drills). Sown on 6th August.

Taree Estate.—Stiff loam; previous crop potatoes. Disc-ploughed in April; fallowed till July; again disc-ploughed, rolled, and harrowed; ploughed, harrowed, and rolled again early in August. Seed sown on 10th August under adverse conditions: seed-bed dry. Owing to cold weather and fear of blight, irrigation was delayed until October. Germination poor; plants spindly.

Mondrook.—Sandy loam; previous crop maize (1918–1919). Ploughed early; harrowed three times; good seed-bed. Sets sown on 24th August; good growth throughout.

Mount George (Mr. Hoad's).—Loamy soil; previous crops, potatoes in 1918; maize in 1918–19; pumpkins in 1919–20. Disc-ploughed in May 15 inches deep; rolled; disc-harrowed and drag-harrowed previous to sowing; seed-bed rather dry owing to wind during the day of planting. Sown on 11th August.

Mount George (Mr. Duff's).—Heavy loam; previous crops, maize in 1918 pumpkins in 1919–20. Disc-ploughed in April; harrowed, disced and harrowed in July; seed-bed in good order. Sown on 12th August. The early months were rather too dry for maximum yields on the two plots at Mount George.

Bandon Grove.—Loamy soil; previous crops, lucerne in 1918; maize in 1919–20. Ploughed in March; harrowed; ploughed again May and early August; harrowed and rolled. Sets ploughed in on 23rd August.

Paterson.—Light sandy loam; previous crops, lucerne; maize in 1919. Ploughed in March; again during July, and immediately prior to sowing, followed each time by harrow. Sets ploughed in on 16th August, then rolled; ladybirds present.

Wallalong.—Old lucerne bed; alluvial. Ploughed early in autumn, left in fallow; ploughed twice in July, and harrowed three times; soil well broken down. Good seed-bed, though rather open. Seed sown on 17th August. Germination good. Green potato grub completely ate out the Satisfactions. Ladybirds in great numbers on the remainder.

Miller's Forest.—Stiff loamy soil; previous crops, lucerne in 1917; maize in 1918; millet in 1919. Ploughed in February; harrowed and scarified in July. Sets ploughed in on 13th August. Grubs and ladybirds present in great numbers. Dry weather at flowering stage had a very harmful effect both on this and on the Wallalong plot. Brownell's Beauty produced runners and no tubers.

Time of Sowing.

Early sowings gave the most satisfactory yields throughout, and planting as early as the middle of July can safely be recommended, especially in a season such as the present, where the months leading up to the spring are wet. Frosts are not to be feared where the soil is well charged with moisture and the cultivator is used to keep the surface soil well worked. It is the practice in some potato-growing regions in America, where frosts are severe, to throw a little soil with the cultivator over the newly germinated plants. While that is hardly necessary on the central coast, the use of the

cultivator often between the rows is strongly recommended. Early-sown crops avoid the dry spells during November at the critical stage of their growth; furthermore, the market is more assured for the early tubers. During the present season, crops marketed during November and early December realised from £14 to £11 per ton, while those marketed after the new year were difficult to dispose of at any price. Many farmers, notably those on the Macleay, let hundreds of bags rot rather than sell at a loss. One farmer marketed 200 bags and received the handsome cheque of £1 5s., with which to cover seed and all sowing and harvesting operations.

Numerous prizes were taken by farmers exhibiting specimens from the plots in local shows.

Varieties and Fertilisers.

Factor, Up-to-date, and Brownell's Beauty were the best varieties, and many exceptionally large tubers of Manhattan were dug. Dalhousies and Early Manistees were fair, Early Rose poor, and Carman the same, owing to the inferior seed. Early Rose and Carman were blighted along the Macleay

In the fertiliser trials, the best results were obtained from P7 (equal parts of bonedust and superphosphate) and P5 (superphosphate four parts and muriate or sulphate of potash one part). Heavy dressings of both (up to 6 cwt. per acre) were profitable, giving greatly increased yields in comparison with smaller quantities. The composition of P8 is equal parts of blood and bone and of superphosphate.

Results of Variety Trials.

——	Wauchope.	J. C. Duff. Mt. George.	Wallalong.	Miller's Forest.	Ghinni-Ghinni.	Taree Estate	
						Irrigated.	Non-Irrigated
Fertiliser.	2 cwt. P7.	2 cwt. P7.	2 cwt. P7.	2 cwt. P7.	2 cwt. P7.	2 cwt. P7.	2 cwt. P7.
	t. c. q. lb.	t. c. q. lb.	t. c. q. lb.	t. c. q. lb.	t. c. q. lb.	t. c. q. lb.	t. c. q. lb.
Factor	13 0 1 6	9 1 2 0	3 8 3 0	.....	5 16 3 14	3 11 2 22	2 16 3 24
Early Manistee ..	13 0 2 3	6 5 0 12	.....	1 7 3 0	.....	1 19 1 4	1 17 1 8
Carman	.....	5 11 0 6	.....	1 7 3 14	.....	3 10 2 24	2 15 3 26
Manhattan ..	.....	6 8 1 10	.....	2 19 3 20	4 10 1 12	.....	.....
Brownell's Beauty	.....	.....	2 9 0 1	.....	5 4 1 12	3 15 2 24	3 9 2 26
Dalhousie ..	12 0 3 0	Very Poor.	2 4 0 7	.....	.....	2 9 0 12	2 11 0 8
Satisfaction ..	.....	.....	.....	2 3 0 24	.....	3 2 3 12	2 19 3 24
Up-to-Date ..	14 0 2 7	8 7 1 13	2 7 0 6	1 15 3 11	7 3 1 26	2 6 0 18	2 2 0 26
Early Rose ..	7 0 2 7	Failure.	2 1 1 0	.....	.....	.....	.....

——	Paterson River.		Williams River.		West Kempsey.	Mondrook.	Sherwood.
Fertiliser.	2 cwt. P7.	2 cwt. P5.	2 cwt. P7.	2 cwt. P5	No Fertiliser.	No Fertiliser.	No Fertiliser.
	t. c. q. lb.	t. c. q. lb.	t. c. q. lb.	t. c. q. lb.	t. c. q. lb.	t. c. q. lb.	t. c. q. lb.
Factor	.....	.....	.....	.....	.....	7 4 0 26	8 8 3 20
Early Manistee ..	0 16 2 22	0 13 3 0	.....	.....	.....	.....	.....
Carman	.....	.....	2 12 10 1	3 10 0 16	3 8 3 0	4 10 1 12	3 19 1 22
Manhattan ..	1 13 1 6	1 5 2 4	.....	.....	7 11 1 0	5 12 3 6	8 15 2 12
Brownell's Beauty	.....	.....	.....	.....	9 0 2 24	.....	.....
Dalhousie ..	.....	.....	.....	.....	.....	6 4 2 10	5 19 2 6
Satisfaction ..	1 3 2 8	0 19 2 16	2 1 2 3	1 15 0 8	.....	.....	5 8 3 20
Up-to-Date ..	0 19 2 16	0 19 2 16	4 16 3 7	4 11 3 1	7 5 1 2	9 6 1 8	4 16 1 0
Early Rose ..	1 4 2 6	1 4 2 6	.....	.....	Failure.	.....	.....

Results of Fertiliser Trials.

Variety used	Wauchope. Up-to-Date.	J. C. Duff. Mount George. Up-to-Date.	Sherwood. Up-to-Date.	Mondrook. Up-to-Date.	Taree Estate. Irrigated. Up-to-Date.	Taree Estate. Non-irrigated. Up-to-Date.	Dumaresque Island. Brownell's.	Wallalong. Early Rose.	West Kempsey. Carman.
	t. c. q. lb.	t. c. q. lb.	t. c. q. lb.	t. c. q. lb.	t. c. q. lb.	t. c. q. lb.	t. c. q. lb.	t. c. q. lb.	t. c. q. lb.
No Manure	11 6 1 21	8 12 3 12	4 16 1 0	9 6 1 8	2 11 0 8	1 19 1 4	9 7 1 16	.....	3 8 3 0
2 cwt. P7	14 0 2 7	9 1 1 4	4 16 1 0	11 2 2 20	2 6 0 18	2 2 0 26	8 19 0 16	2 1 1 0	4 2 2 0
3 ,, P7	.....	.....	4 17 1 20	.....	2 19 3 24	2 1 1 0	10 14 2 0	2 9 0 12	.....
4 ,, P7	.....	9 12 1 2	.....	11 19 0 18	.....	.....	.....	.....	4 5 1 2
5 ,, P7	.....	.....	5 6 0 8	.....	.....	.....	.....	.....	.....
6 ,, P7	.....	.....	.....	12 6 0 8	.....	.....	.....	.....	5 4 0 12
2 ,, P5	.....	.....	5 10 0 0	9 6 0 27	.....	.....	.....	2 1 0 8	.....
3 ,, P5	11 6 1 21	8 12 3 12	5 5 1 4	10 2 2 18	3 12 2 20	2 19 3 24	11 3 3 20	3 9 2 16	.....
2 ,, P8	.....	.....	.....	.....	.....	.....	.....	.....	.....
3 ,, P8	11 0 0 0	8 5 0 0	.....	.....	3 3 3 10	2 9 0 12	9 13 1 4	.....	4 19 0 22
4 ,, P8	.....	8 1 1 9	.....	.....	.....	.....	.....	.....	.....
2 ,, Superphosphate	.....	8 7 1 13	.....	.....	.....	.....	.....	.....	.....
3 ,, Superphosphate	.....	.....	.....	.....	.....	.....	9 10 3 20	.....	.....
4 ,, Superphosphate	.....	9 1 2 0	.....	.....	.....	.....	.....	.....	.....

At Miller's Forest the fertiliser trial failed, owing to Brownell's Beauty not setting tubers.

A fertiliser trial which included nitrate of soda, was conducted at Mr. T. Hoad's farm, Mount George, the results being as follows:—

Fertiliser.	Yield. t.	c.	q.	lb.
No manure	10	7	2	3
3 cwt. Superphosphate ...	11	9	3	8
3 cwt. Superphosphate and ½ cwt. nitrate of soda ...	11	9	3	8
3 cwt. Superphosphate and 1 cwt. nitrate of soda ...	11	11	3	4
4 cwt. Superphosphate ...	11	6	3	14
4 cwt Superphosphate and 1 cwt. nitrate of soda ...	11	10	3	6

The nitrate of soda was sprinkled along the rows about six weeks after germination.

All the fertilised plots outyielded the unfertilised plots, and very little increase—if the 1 cwt. application with 4 cwt. superphosphate be excepted—was gained by the top-dressing with nitrate.

An experiment was conducted on the same farm in distances of sowing, with results as follows:—

Section I.						Section II.					
Rows Apart.	Distance Apart in Rows.	Yield. t.	c.	q.	lb.	Rows Apart.	Distance Apart in Rows.	Yield. t.	c.	q.	lb.
(*a*) 27 inches	22 inches.	11	2	3	22	(*e*) 36 inches	22 inches.	8	0	0	10
(*b*) 27 ,,	18 ,,	7	18	0	14	(*f*) 36 ,,	18 ,,	8	10	3	16
(*c*) 27 ,,	14 ,,	8	6	3	24	(*g*) 36 ,,	14 ,,	9	18	1	26
(*d*) 27 ,,	10 ,,	8	9	3	22	(*h*) 36 ,,	10 ,,	8	19	2	16

In analysing the above, it will be noticed that in Section I (*a*) planting the sets about 2 feet apart, both ways, gave the highest yield, while the close planted plot (*d*) yielded considerably less. Planting in drills too close has as its chief drawback the difficulty in scuffling without damaging the tubers, &c.

In Section II a very satisfactory yield resulted from (*g*), the method usually adopted in all the experiment plots, and also from (*h*). Sowing at the maximum distance both ways (*e*) resulted in a low yield.

An experiment to demonstrate the value of "greening" the tubers was also conducted on the same farm. A quantity of seed was kept spread out in a shed; at the same time similar seed was placed in shallow trays, in single rows, rose ends upwards, and kept in the open, and covered at night when frosts were likely. Three weeks later the two lots were sown side by side. The "inside seed" had developed good shoots, white in colour, whereas the "outside seed" had gone greenish in colour, and had developed strong, firm, short green shoots, making an attractive sample of seed. Although the period allowed for "greening" was rather short, the weights were in favour of the latter method. Earlier maturity is another favourable feature of this procedure, but probably owing to the short period allowed very little difference was noticed in this respect.

The following are the yields from the two lots, the seed being sown in rows 3 feet apart, and 14 inches apart in the drills:—

Sets.	Yield. t.	c.	q	lb.	Sets.	Yield. t.	c.	q.	lb.
2½ oz., halved, kept in shed	13	1	1	0	2½ oz., halved, greened in open ...	13	10	0	10

Another experiment testing the size of seed was also made:—

	t.	c.	q.	lb.
1½ oz. tubers (whole)	12	10	2	16
1½ oz. half-sets	12	0	1	20
3 oz. sets (whole)	13	15	2	7

Whole tubers yielded better than half-sets of similar weight. Large whole tubers yielded 1¼ tons more than the small whole tubers.

A Boom in Tested Cows.

Many advantages have been claimed for the keeping of milk records of dairy cattle, but it needed a series of very successful sales in England in 1920 to demonstrate the financial possibilities of this side of herd-testing—as we are wont to call it in New South Wales. The Irish Department of Agriculture's *Journal* remarks that "it is quite conceivable that these sales mark the beginning of a new era in which the authenticated milk record will be the determining factor in deciding the value of a dairy cow." Then follows the particulars of several sales of cattle held in England in the latter part of 1920, the average price and the number of cows sold at each being shown. Somewhat at random we may take the following:—On 2nd September, at Reading, seventy-seven cows averaging £106 16s. 5d.; on 14th September, at Oxford, thirty-nine cows averaging £112 6s.; on 23rd September, at Oxford, sixty-two cows and heifers averaging £110 13s.; on 5th October, at Cambridge, ninety-one cows averaging £74 14s. 8d.; on 12th October, at Yeovil, thirty-three cows averaging £128 7s. 6d., and so on; sixteen sales are thus particularised, and the lowest average was £74, over a sale of 80 heifers.

The animals were sold as non-pedigree cattle, and were mainly of the dual purpose Shorthorn type. The record price was 270 guineas, paid at Oxford on 23rd September, for a non-pedigree four-year-old cow of Shorthorn type, and several cows at the sales realised over 200 guineas. In many cases the sales were dispersal sales, entire herds coming under the hammer.

A few years back, adds the *Journal*, such averages would have been considered highly satisfactory for herds with long pedigrees and fashionable breeding.

An attempt was made in one case to determine the increase in price attributable to herd-testing. The herd consisted of thirty-two cows and sixty-seven heifers. Less than a month before the sale a local valuer valued the lot at £3,812. At the sale the herd realised £6,800, or practically 80 per cent. more.

The logic of such facts is surely irresistible.

Farmers' Bulletin, No. 138, which details the results of the nineteenth year's egg-laying tests at Hawkesbury Agricultural College is now available, and copies are obtainable on application to the Under Secretary and Director, Department of Agriculture, Sydney.

Field Experiments with Wheat.

Cowra Experiment Farm.

C. McCAULEY, Assistant Experimentalist.

[The Experiments Supervision Committee, under whose control these experiments are conducted, direct attention to the fact that definite conclusions cannot be drawn from the experiments of any one year, but the results are published for the information of farmers.]

An experiment, the object of which was to determine the most suitable varieties of wheat for hay and grain locally, was conducted at this farm. It was divided into four sections, namely, early planting for hay and for grain, and late planting for hay and for grain.

The early planting sections were sown at the rate of 42 lb. per acre on 15th April, 1920. superphosphate being applied at the rate of 60 lb. per acre. Germination took place on 22nd April, the seed-bed being in excellent order and free from weeds. Owing to the dry weather prevailing during May the early growth was very slow, but good rains fell during June, and the subsequent growth was very rapid. Warden and Hard Federation made the best early growth. All plots had evened up by the end of July, though Warden had made far more vigorous growth than the other varieties.

The late planting sections were sown at the rate of 52 lb. per acre on 12th May, 1920, superphosphate being applied at the rate of 60 lb. per acre. Germination took place on 24th May, and owing to the favourable season all plots made rapid growth. Gresley, Firbank, and Clarendon made the best growth throughout the season.

The plots were so tangled about by heavy storms during October and December that it was impossible to harvest individual plots in the grain section.

The plots measured $\frac{1}{8}$ acre. The hay yields per acre, based on percentage, were as follows:—

Early Planting Section (Hay).

Variety in order of Merit.	Yield.			
	t.	c.	q.	lb.
Warden (average of check plots)	4	10	2	22
Zealand	4	5	0	4
Marshall's No. 3.	4	4	0	15
Cowra No. 20	4	2	1	25
Bomen	4	1	2	22
Hard Federation	3	17	1	5
Yandilla King	3	11	1	1
Warren	3	9	1	25

Late Planting Section (Hay).

Variety in order of Merit.	Yield.			
	t.	c.	q.	lb.
Gresley	4	8	2	12
Wagga No. 47	4	2	0	13
Clarendon (average of check plots)	3	16	1	1
Cowra No. 19	3	3	2	15
Firbank	3	2	3	21

Nyngan Experiment Farm.

J. DOUGLASS, Experimentalist.

VARIOUS experiments were carried out at this farm during the season 1920. For Nyngan the season was a very wet one, 12·30 inches of rain falling during the growing periods, and the variations between some of the plots was very small indeed, particularly in the ploughing and mulching experiments, which therefore have less value than in a season of more average conditions.

Wheat Variety Trials.

The object of this experiment is to discover the most suitable variety of wheat to grow in this district for (*a*) hay and (*b*) grain. The experiment was carried out this year in Block A, Paddock 4, which, like the other experiment paddocks, is running under a triennial rotation. The whole of the area was ploughed early in July, 1919, the soil turning up dry and cloddy, in good open condition for a long fallow. The spring-tooth cultivator was used to preserve a mulch, and the plots were uniformly cultivated on 16th December, 1919, 30th January and 3rd February, 1920. The fallow was free from weeds, and an excellent mulch was maintained,

The early plantings were made on 17th April, the seed-bed being too dry for germination. The late plantings were made on 31st May. In both cases superphosphate was applied at the rate of 30 lb. per acre, and Hard Federation was used on the check plots. The seeding in the early plantings was at the rate of 20 lb. per acre, and in the late plantings 27 lb. per acre

No seed germinated until June, and both plantings were germinated by the early June rains. In the early plantings, Sunset, Clarendon and Canberra germinated very well, while the selections from Hard Federation and Ecksteen were very backward. Firbank seed from Cowra germinated much better than that produced at Nyngan; there were marked differences throughout the growing period. Among the late plantings the germination was again very good, occurring four or five days later than in the early plantings. Clarendon and Canberra were very good, the selection from Hard Federation was very backward, and most of the Hard Federation checks were very good. Both lots of Firbank germinated very well, and very little difference could be noticed between them.

YIELDS per acre, based on percentage.

Variety.	Grain.				Hay.							
	Early Planting.		Late Planting.		Early Planting.				Late Planting.			
	bus.	lb.	bus.	lb.	t.	c.	q.	lb.	t.	c	q.	lb.
Sunset	40	55	34	18	2	13	1	14	2	19	0	0
Canberra	37	0	38	36	3	5	2	14	3	8	3	14
Firbank (Nyngan)	32	16	25	42	2	14	2	14	3	13	0	0
Firbank (Cowra)	31	24	24	48	2	16	1	0	3	14	1	14
Selection from Hard Federation	31	5	27	36	2	11	1	0	3	10	1	0
Ecksteen	29	27	26	0	2	5	3	14	2	16	3	0
Clarendon	26	54	33	36	2	17	1	0	3	3	1	14
Improved Steinwedel	24	20	22	30	2	6	0	0	2	15	3	0
Hard Federation (Average of check plots)	30	20	32	0	3	3	2	0	3	7	2	14

Ploughing Experiment.

The results in this experiment showed little variation as a result of the different treatments, sufficient moisture being present in the soil under all forms of ploughing to bring the crop to the greatest development possible under Nyngan conditions.

The average yield from the check plots (disc-ploughed, 6 inches deep) was 2 tons 19 cwt., and the increase or decrease from the various treatments did not in any case exceed the margin allowed to cover possible experimental error in tests of this kind. A detailed report is, therefore, not published. A summary of the results for nine years appeared in the *Agricultural Gazette*, December, 1920. The experiment will be continued.

Mulching Experiment.

This experiment has now been carried on for nine years, mulching with a number of different implements being tried in conjunction with a previous ploughing with either the disc or the mouldboard plough. Summarised results obtained by the several methods of mulching show very little difference: the outstanding facts are the superiority (1) of the mulched over the unmulched plots, and (2) of a fallow mulched some time before planting as compared with one mulched just before planting. One section of the experiment was designed to ascertain which month was most suitable for mulching, but the results from mulching in October, November, and December varied so slightly as to indicate no reason for any preference. The experiment has now been rearranged in the light of the information so far obtained, and will be continued.

Progress in Control of Animal Diseases.

A systematic campaign against tuberculosis in live stock was begun by the Department of Agriculture in the United States three years ago, with results that already show what can be done when scientific knowledge comes to be associated with organising powers. On 30th June, 1920, 3,370 herds were officially credited by the Department with being free from tuberculosis, which was approximately the number at the beginning of that year. In addition, 16,600 herds had successfully passed one test. During the year 695,000 animals were examined, of which under 30,000 reacted to the test, and had to be destroyed.

Applications for testing have accumulated more rapidly than they could be handled by the available veterinary officers, and near the end of the year 4,740 herds were on the waiting list.

Progress is also being made in the control of hog cholera, and it is estimated that already an annual saving of 41,000,000 dollars has been effected in relation to this disease.

Apples that are affected with the small black blotches on the skin, known as black smut, may be cleaned by rubbing each one in a handful of sand. A case of soft wet sand and a bucket of water is all that is required. After being rinsed in the water, the apples should be placed in a case or on a bench to drain.—L. Gallard, Fruit Inspector.

Elephant Grass, or Napier's Fodder.

E. BREAKWELL, B.A., B.Sc., Agrostologist.

SINCE the last article on this grass was published in the *Agricultural Gazette*, December, 1919, a good deal of further information concerning it has been obtained, and the time may be said to have arrived when it should be dealt with more freely, and the results finalised which have been obtained by the Department and by over 100 farmers who have reported on it in different parts of the State.

It is a native of tropical Africa, being confined to the area between 10 deg. north latitude and 20 deg. south latitude. Within this immense area it occurs mainly along watercourses and in marshy depressions, but also enters the bush and forests where open spaces afford sufficient light. Under favourable conditions it forms extensive reed jungles, as for instance in the delta of the Zambesi. In the interior of Sierra Leone, it ascends nearly to 2,700 feet, and near its southern limit, in Rhodesia, to 5,500 feet. In rich marsh land it attains a height of 21 feet or more, whilst on drier soils, as in the savannas of East Africa, its stalks are hardly more than 6 feet high. In Togoland it has been called Elephant Grass by the colonists, while in Rhodesia it is termed Napier's Fodder, after Colonel Napier. The first mention of the grass was made in 1905, when it was stated to be a good fodder for cattle. Pigler in 1908 described it as one of the best fodder grasses. (Kew Bulletin, 1912).

The Rhodesian Agricultural Department commenced to take up its cultivation in 1910, Colonel Napier co-operating. The latter tested it under severe conditions, and became fully convinced of its economic value.

A parcel of seed was obtained by the Agricultural Department in this State in 1914, and only one seed grew. The resulting single plant became the origin of all the areas now established at the experiment farms, in addition to the thousands of roots distributed to various farmers.

Description.—Elephant Grass (*Pennisetum purpureum*) belongs to the *Pennisetum* family, a near relative being Pearl millet (*Pennisetum typhoideum*). It is a coarse grass, and characterised by extremely rapid growth. Under warm conditions it will attain a height of 20 feet in a few months. It grows in tussocks, and stools considerably. The leaves are 2 feet or more long when fully grown and somewhat coarse, being similar to those of maize. In young plants, however, and in the growths that follow grazing, the leaves are soft and succulent. There is a fair amount of variation in the hairiness of the plant, in some cases the stalks and leaf sheaths being practically glabrous, while in others both are extremely hairy. This variation has also been noticed in Africa in the natural habitat of the grass. The stems after reaching a height of over 6 or 7 feet, become hard and woody. It has been

found by analysis, however, that the feeding value of the mature stalks is comparable to that of maize stalk roughage. In most localities the grass flowers on maturity, but seldom sets ripe seed. On the Northern Rivers and in Queensland ripe seed is formed to a small extent. The flower heads have the characteristic bristles of *Pennisetum*, and are 4 or 5 inches long.

Adaptability to Soil and Climate.

To date Elephant Grass has shown itself adapted to the coast, tablelands, and the slopes, and in the far west it does well under irrigation. It will grow on all classes of soils, but gives the best results on alluvial, volcanic, or good sandy loams. As a proof of its wonderful aptitude for growing on poor country it may be mentioned that some coastal land just south of Newcastle, previously devoted to burrawang and useless scrub, has now Elephant Grass growing there in abundance, providing a considerable amount of good feed.

Fig. 1.—Elephant Grass at Hawkesbury Agricultural College—before being eaten off.

Good results have also been obtained on barren soils at the mouth of the Manning River, and it should prove useful in bracken or useless scrub country.

Everyone who has grown Elephant Grass has been impressed with the remarkable rapidity with which it develops. In the warm months of the year, if provided with plenty of moisture, it grows over 2 feet a week. Light frosts do not severely affect it, but continuous heavy frosts will kill the flag entirely, though without injuriously affecting the roots, for records from very cold localities show that it readily comes away again in the spring. In western districts it seldom reaches a height of over 6 feet, but stools

considerably, a single cutting producing forty or fifty stalks in a single season. As a consequence, it has produced at Cowra Experiment Farm a greater yield for the season than any other grass tried.

That this grass will stand a considerable amount of drought has been proved beyond all doubt at Hawkesbury Agricultural College, Cowra Experiment Farm, and in other localities. Hardly a plant was lost at the College during the great drought, and comparatively few were lost at Cowra during the same period. What Elephant Grass will not endure are the hot winds and the extremely hot surface of the red soil plains in the summer months, and it is hardly worth growing west of Narromine.

Fig. 2.—The same plot as in Fig. 1—after being eaten off.

Elephant Grass responds to a good rainfall, the conditions most favourable to it being those of the Northern Rivers, but it does not like cold swampy subsoils.

Palatability and Feeding Value.

The appearance of Elephant Grass is extremely deceptive. At first sight it looks unpalatable, but that it is not so is proved by official investigations under varying conditions, and also by the numerous reports submitted by farmers. Elephant Grass is not as palatable as many other well-known grasses, but that cattle will eat it and do well on it is beyond question. Its palatability appears to be greatest in its young, more succulent stages. When it reaches a height of 7 feet or over its woodiness is against it, though even under these conditions the softer ends of the stalks and leaves are readily eaten. Sheep appear to like the grass least of all when other grasses are about, but they will eat it and thrive on it when other feed is not abundant.

This has been the experience at Cowra Experiment Farm. The illustrations showing the grass at Hawkesbury Agricultural College before stocking and after stocking speak for themselves.

The chemical analysis of the grass was published in the *Agricultural Gazette* in July, 1917, it being shown there that the grass was most satisfactory as regards its food value. Analyses have also been made in connection with the growth that follows grazing and cutting, with the following results: –

After cutting.		After grazing.	
Moisture	14·27	Moisture	13·52
Albumenoids	11·28	Albumenoids... ...	11·97
Ether extract	1·65	Ether extract ...	1·20
Ash	17·55	Ash	9·95
Fibre	27·43	Fibre	31·94
Carbohydrates	27·82	Carbohydrates ...	31·42
Albumenoid ratio ... =	1:2·8	Albumenoid ratio =	1:2 8
Nutritive value ... =	42·8	Nutritive value =	46·0

The results show a slightly favourable margin for the grass under grazing.

Milk Producing Qualities.

At Hawkesbury Agricultural College the milk and butter-fat records of eight cows were taken while they were feeding on the Elephant Grass, and also during occasional periods when they were taken off the plot and allowed to graze on the natural pastures. These recorded twenty-eight milkings while the cows were feeding on the grass, and fifty-five milkings while they were off.

Average Milk Yields and Tests of cows at Hawkesbury Agricultural College.

	On Elephant Grass.		Off Elephant Grass.	
Number of Cow.	Average milk yield.	Average Test.	Average milk yield.	Average Test.
	lb.	per cent.	lb.	per cent.
162 ...	15·90	4·70	13·70	4·70
86 ..	13·38	4·98	11·90	5·23
348 ...	17·20	4·18	15·50	4·51
607B ...	15·57	4·91	14·05	4·94
239 ...	13·02	4·68	11·73	4·76
20 .	11·41	5·22	10·40	5·35
655 ...	12·29	4·44	11·19	4·66
5 ...	10·54	5·21	9·85	5·04

The results appear sufficiently conclusive that the milk yields and butter-fat tests are maintained on Elephant Grass. It might be added that the ordinary pastures of the College were in very good condition at the time the test was carried out.

How to Plant Elephant Grass.

Elephant Grass can be raised from seed, but such seed should be sown in a nursery bed, and the young plants transplanted to the permanent paddock. Early summer is the best time for sowing.

The best method of propagation, however, is by planting rooted slips or cuttings. The former can be planted in spring or autumn and the latter in spring only. The slips and cuttings have wonderful vitality, and a case is on record where certain cuttings, having been kept for over a month, were soaked in water before being planted, and a 60 per cent. strike resulted.

Cuttings should be obtained from the fairly-hard portions, and should have three nodes. They should be planted in cultivated ground, at distances of 3 feet apart. The slips can either be inserted in the soil with two nodes in the ground and one out, or shallow furrows can be ploughed 3 feet apart, and the slips or cuttings dropped horizontally in the furrows, and the ridged soil turned back upon the cuttings by reversing the direction of the plough.

Fig. 3.—Elephant Grass showing a month's growth after being pastured close to the ground.

Carrying Capacity.

A fodder that will produce 70 to 80 tons of green feed per acre in a season must necessarily have a good carrying capacity. It is very difficult to obtain the actual carrying capacity of the grass, owing to it having to be fed off at intermittent periods. It may be said that when 6 feet high it requires to be very heavily stocked to ensure it being eaten down. The cows should then be removed until the grass has made new growth. In the winter months no growth is made, but during the summer Elephant Grass will maintain ten to twelve cows per acre at periodical intervals.

Behaviour under Stocking.

As a rule stock eat the top leaves and stalks of Elephant Grass, and from the joints below several tender shoots spring out, and these are always appreciated.

Owing to its rapid growth in midsummer Elephant Grass often grows quicker than the stock can eat it, and when over 6 or 7 feet high it develops woodiness. Under these conditions a succulent growth can be induced by cutting the grass, not near the base, but a couple of feet above the surface of the ground.

The plants stool considerably, and in the second year it will probably be found that all available room is taken up. Experiments are now being conducted to determine the advantage, if any, of planting the roots at a greater distance apart, and filling up the spaces between with a vigorous creeping grass like Kikuyu Grass.

Fig. 4.—Elephant Grass at Cowra Experiment Farm.

The Testimony of Farmers.

It would be impracticable to quote the very many favourable reports (over 100 in number) received from farmers, but a selection of the testimonies will be of interest.

The Coastal Districts.

Mr. M. Lamb, Mullumbimby.—Had three cuttings. Consider it better than cane because can get so many cuttings.

Mr. A. Smith, Dungog.—Stooled in a wonderful manner. Cattle and horses ate it readily. At the first cutting there were five bundles from each plant containing as much as a man could get his arm around. At the second cutting in the same season it was 7 feet high.

Mr. A. Campbell, Bullahdelah.—The weather was dry when the cuttings were put in, but they made much better growth than Indian cane alongside.

Mr. F. Pile, Dungog.—Stood up well during the late drought, even after the severe frosts of last winter, when it was cut down to the ground. Now, after the rains, the growth is excellent. I feel sure it will be a successful plant as a stand-by in dry seasons, but I think it will be best suited for growing in small paddocks and grazed off.

Mr. H. Wilcox, Ourimbah.—Roots planted last spring (1919) on hillside land, which was a friable loam with chocolate subsoil. When 6 feet high the cows found their way in, and ate the crop down to the ground. Although Indian cane was growing alongside the grass very little of the cane was eaten. Recently we cut on an average seventeen stalks to a plant, about 14 feet high.

Mr. S. Ruprecht, Lansdowne.—Has grown 9 feet high, and looks well and promising, and I think it will be good feed for stock. Several people have been to see it.

Mr. W. G. Richardson, Towradgi, South Coast.—The plants are now about 10 or 11 feet in height, and I intend chaffing it for silo purposes. I have two sorts of grass, one has a broad leaf and thick in the stem, but does not flower or seed. The other grows something like sorghum, only it shoots out at every joint, is much taller than the other, and comes out in seed. They are both heavy yielders of fodder. Two calves kept the plot eaten down, and they did very well on it. I am keeping it eaten off.

Messrs. Palmer and McKenzie, *viâ* Eden.—Every plant grew. The cattle ate it right down when it was about 3 feet high. In the last fortnight it has grown over a foot, and has stooled tremendously.

Mr. W. Gow, Macksville.—Have had a most severe winter, coldest in memory, and many of the leaves of the grass fell off, but they still retained their juice, and when chaffed, horses and cows ate it greedily. When stalks get old stock do not care much for it, but are very fond of it when chaffed, and I am satisfied it is a better milk producer than the cow cane. It makes good sweet-smelling hay when cut 3 or 4 feet high, and provides good chaffed feed in winter when grass is scarce.

Mr. J. H. Curran, Copeland.—Stock do not seem to care for it after it has reached 5 or 6 feet, if cut and fed the same day, but they eat it greedily after it has wilted for a day or two, no matter what size it is.

Good reports have also been received from Casino, Newcastle, Sydney suburbs, Bega, Gosford, Eden, Ourimbah, Milton, and Landsdowne.

The Tablelands.

Several New England growers report favourably concerning the summer growth of Elephant Grass, but little information is available concerning the manner in which it endures the cold winters there. The following is representative :—

Mr. F. Thomas, Deepwater.—Roots planted in a rich loam on a river flat. On reaching a height of 2 feet I grazed the plot off, cattle taking readily to it, and evidently finding it very palatable. The roots stooled out well, and before winter some of the clumps were 7 feet high, and a foot or more in diameter. The first frost early in May touched the grass, and I cut it for hay. The grass was very coarse and tough, and the cattle ate it as hay, leaving the thicker stems. The winter frosts apparently killed a good percentage of it ; the best is now making excellent progress, being 2 to 3 feet high. It is a very rapid grower, but I think *Phalaris bulbosa** is better suited to the district.

Mr. F. N. Wrigley, Glengarry, Glen Elgin, *viâ* Glen Innes, states that it did better than Sudan grass.

Mr. R. Chard, near Glen Innes, states that it reached 9 feet, with sixty or seventy stems from one root. I have seen nothing in fodder line to make such growth.

Mr. W. E. Parry, Springwood.—It was planted on new ground—a sandy loam of good depth with little or no manure. There has been dry weather since, but it has done well. It has stooled out abundantly, and in some cases there are forty or fifty stools to a plant The cattle got in once and ate it down tight, and since November last I have cut it three times. The animals like it, and do not leave a blade in the feed box.

Mr. T. Barker, The Elms, Yarra, Goulburn.—Grew splendidly until the frosts cut it back, but it is now sprouting again.

There are also good reports from Leura, Taralga, Araluen, Tumbarumba, and other cold localities.

* This is true only for winter conditions.—E.B.

Western Districts.

More reports have been received from the western districts than elsewhere, and space only allows the inclusion of a few.

Mr. O. WHITTLE, ALLOWAY, *vid* NARROMINE.—Shoots from two grew 1 to 5 feet by December, and stooled fairly well. I cut one back to about 1 foot from the ground and now they are both the same height, viz., 8 feet, have over thirty canes each, and are still green and thriving. I put some in a grass paddock with a hoe. These are 3 feet high, have six canes each, and are still green. I planted some other roots at the water's edge of a cowal. These roots have stooled the same as those put in with a hoe, and are about the same height. There is no doubt about this grass thriving well under cultivation.

Mr. DOUGLAS, FAIRFIELD, COONABARABRAN.—The grass is doing well; it has caused considerable comment locally, being grown on a sandy soil with practically no rain.

Mr. C. F. SACKER, WALLENDBEEN.—The plants have stooled to about twenty shoots. I planted them alongside a lucerne plot, and when the cattle were feeding off the plot they ate the grass with apparent relish. Will divide up the stools.

Mr. J. PARSLOW, GILGANDRA.—The plants grew to a height of 4 feet and spread 2 feet across. Fed stalks to horses, cattle, and pigs, and they were readily eaten. In the spring the grass came away well again.

Very favourable reports have also been recieved from Gulgong, Denman, Albury, Yarramalong, Dubbo, Mudgee, Yanco, Tamworth, Binnaway, Dyer's Crossing, Warialda, Singleton, Gundagai, Boorowa, Quirindi, Gunnedah, and Boggabri.

Summary.

1. Elephant grass can be treated either as a fodder or as a pasture grass. As a fodder it is not recommended for situations where maize or other summer crops will grow, but it will produce most satisfactory results on poor soils.

2. Elephant grass should be cut or pastured before reaching a height of six or seven feet; the succulence of the plant improves considerably under grazing.

3. Elephant grass produces greater fodder yields in our coastal districts than any other plant known.

4. It is an excellent grass to grow in our wheat-growing districts for summer feed.

5. Records from Hawkesbury Agricultural College, and also from the United States, show that cows maintain their milk yield when pastured on Elephant grass.

PROPAGATING MUSHROOMS FROM NATURAL SPAWN.

THE mushroom spawn that is sold in bricks can sometimes be induced to start growing, though apparently old, by thoroughly moistening it and keeping it warm.

Spawn may be produced by taking a number of mature mushrooms and placing them in a manure bed, and covering them over with about 3 inches of manure. It can also be produced by digging up the soil around the spot where mushrooms have grown naturally in the field, and transferring it to a manure bed.

The manure bed must be made from fresh manure containing straw, and must be well fermented and aerated. The spawn should be placed in the bed when the temperature is 80 deg. Fah.—G. P. DARNELL-SMITH, Biologist.

The Feeding of Sheep in Times of Drought.

[Continued from page 386.]

[At the termination of the 1919–20 drought, circulars were issued by the Stock Branch with a view to the collection of information on the methods of feeding sheep during the preceding months of scarcity. Valuable information was provided by several stock inspectors and others, particularly by Mr. C. J. Woollett, Stock Inspector at Tamworth. From these replies and other sources, the following excellent article has been compiled by Mr. W. L. Hindmarsh, B.V.Sc., M.R.C.V.S., D.V.H., one of the veterinary officers of the branch.—S. T. D. Symons, Chief Inspector of Stock.]

We may now proceed to discuss the various fodders used during the drought, and to quote extracts from the replies of various graziers to the questions asked by the Stock Branch.

Scrub Feeding.

The varieties of native scrub and trees available for feeding stock in drought depend on the districts affected. Probably the best known are kurrajong, wilga, mulga, myall and willow; others not so palatable but extensively used are apple, box, rosewood, boree, pine, &c. Certain drought-resistant plants, such as saltbush, &c., are not included in this category, since they are the natural sheep food of the western districts. It is a matter of regret, as some stockowners are beginning to realise, that these natural fodders should have been so ruthlessly cut out. Even when being cut for sheep it was noticed that in some cases, instead of being lopped the trees were felled, thus destroying their future usefulness, not only as food but as shade and shelter.

It must be borne in mind that these are only emergency fodders. They do not provide a balanced ration, and while alone they may keep up the health of stock for a limited period, eventually condition will be lost and signs of digestive disturbance be noted. In any case they are entirely unsuited to lambing ewes. Their value is much increased by—

(*a*) The addition of small amounts of grain daily, say, 4 to 8 oz. per sheep.

(*b*) The addition of salt, epsom salts, and molasses in the form of a lick. This acts as a corrective, and lessens the liability to impaction of the digestive organs. The proportions might be 1 part epsom salts, 3 parts Liverpool salt, 4 parts molasses. The amount of epsom salts might be increased if deemed necessary. Sulphate of iron, although it is recommended as a good tonic in normal seasons, should not be used, as it is an astringent and increases the liability to constipation.

(*c*) Adding a little hay to the above ration. If hay is added even only once or twice a week the stock would resist the adverse conditions more successfully.

It will be noted that in some cases sheep do not relish the scrub when freshly cut, but later, when it is drier, they eat it readily. From the replies received from graziers on this question of scrub feeding we make a few extracts, grouping them according to the portion of the State from which they come, and devoting a separate paragraph to each reply quoted. It will be seen that they emphasise the fact that scrub is only an emergency fodder, and that it must be accompanied by other food if the scrub feeding is continued over an extended period. The italics are our own.

Northern Tablelands.—We started to feed on box leaves in March, 1919, and continued until December. There was a bit of dry feed to pick up for the first six months, but after that they only had box leaves. We gave them plenty of salt and epsom salts. *The ewes in lamb died first; we lost half of our sheep.*

For two years I lopped box leaves for 300 Merino sheep. They were doing fairly well until the heavy rains came. I have *only* 170 *left, and have not had any lambs for two years.*

I fed 1,000 sheep for twelve months on white box leaves *without any loss.* I also gave them 4 *to* 5 *quarts of molasses* twice a week in their water trough. The sheep were Lincoln crossbreds.

I fed about 400 ewes in lamb on mixed scrub. About the *time they started to lamb they commenced to die. I do not think I saved* 50 *ewes* and got one lamb.

We fed dry sheep in good condition—two-tooth to six-tooth—on box and apple leaves. We frequently *changed the paddocks.* The sheep were kept *in small lots,* and we frequently lopped for them. A plentiful *supply of salt* was given—*results were good.*

Far West.—Scrub was mulga, but leaves were very dry. The stomach became impacted with dry food. *Deaths from dry bible were frequent.*

Other Reports.—During winter, 1919, we fed 600 ewes on apple-tree from March to December and kept them in good condition without many losses. We *only marked* 5 *per cent. of lambs.* We kept the sheep well supplied with a lick of 30 lb. Liverpool salt and ½ lb. of epsom salts.

I fed lambing ewes on kurrajong, and only lost 10 per cent. of grown sheep. *Lambs all died in seven to ten days.*

I find that ewes and lambs will thrive on kurrajong provided they are supplied with sufficient quantities. *During pregnancy I think something else is required with it.*

Ensilage.

The necessity of conserving the natural fodder which makes such abundant growth in the pastures in good seasons has constantly been emphasised by the Department. While most stockowners will agree as to the wisdom of this course, few attempt to put the principle into practice, and forage that would help to carry stock over a dry season is still allowed to go to waste. It is well understood that in some parts, owing to the nature of the ground and herbage, and the presence of fallen timber and stones, it is not possible to use farm machinery to get the crop off. Where it is practicable, however, the farmer should never fail to turn the surplus growth into ensilage, and thus insure himself in the most economical way possible against drought. According to the district and season, prolific growth of trefoil, marshmallow, variegated thistle, crowfoot, and other herbage might well be utilised for the making of silage. Where the sheepowner is in a position to do it, silage can, of course, be made from most of the green crops usually cultivated. Maize, sorghum, lucerne, wheat, oats, and various grasses have all given successful results.

In one case only was the feeding of ensilage to sheep reported upon adversely, and then no particulars were given. Against this is the fact that numerous graziers reported excellent results. Not only did the sheep keep up their condition but the ewes produced sufficient milk to rear the lambs. The cost of the preparation of silage is small compared with the cost of hay and other feeds in dry seasons. In one case recorded, the cost of pitting was 11s. a ton.

Feeding should commence while there is still a little dry feed about, and about 1 lb. should be given daily. This quantity can be increased as required up to 3 lb. per sheep per day, which is sufficient to keep the sheep in condition. Where practicable, the addition of a little grain twice a week is an advantage.

The example set by the contributors of the following reports might well be emulated. The paragraphs are taken from the letters received from sheep-owners in the districts mentioned, each paragraph being an extract from a separate letter :—

Southern Tablelands.—I fed 2 lb. of lucerne ensilage to lambing ewes daily. Fed by trailing. The ewes did well—*marked* 80 *per cent. lambs.* There appears to be nothing like lucerne ensilage for lambing ewes.

The best results were obtained by feeding for four days on ensilage and three days lucerne hay per sheep. Three thousand ewes marked 43 per cent. of lambs with a loss of only 90 ewes.

Northern Tablelands.—Fed up to 3 lb. ensilage daily to sheep. The ensilage was made of trefoil, borang, and variegated thistle, having been pitted two to three years, each pit containing 250 tons. Was sweet smelling, and partaken of readily by sheep. Fed to 12,000 sheep for twelve months. They *marked with excellent results.* Ewes and young lambs do well on it. *Ewes show plenty of milk*, and hold fair condition.

Riverina.—In suitable places, such as frontages to a creek, almost unlimited quantity of grass can be cut in good seasons and made into hay or ensilage at a minimum of cost. Both methods have been tried here with good results.

Central Plains.—Ensilage, with a little grain, is best of all for feeding sheep.

Hay, Chaff, and Straw.

On the whole these have not been reported upon favourably as fodders for sheep when used alone. The consensus of opinion is that hay feeding is not economical, as it is scattered and trampled into the dust when fed; moreover the initial expense is very great if it is purchased at drought prices. Chaff may be fed from troughs, but it is liable to be blown about and to get into the sheep's eyes unless damped. These fodders are of course preferable to scrub and some good results have been reported in dry sheep, but almost invariably stockowners have stated that on lucerne, oaten or wheaten hay, ewes (even if they keep fair condition) do not secrete sufficient milk to rear their lambs.

With the addition of some grain and damped with brine or molasses and water better results have been obtained, as in this case the ration contains more nutriment material and the salt and molasses help to correct the constipating effect of a continuous ration of dry food. While one stockowner claimed to have reared 75 per cent. of lambs when hand-feeding lucerne hay–

possibly local conditions were of assistance—other reports mention the marking of 10 per cent. and 12 per cent. lambs after ten weeks' feeding on similar fodder.

Bush hay may be cut and stored from the natural pastures. It is common to see fine crops of native grasses allowed to go to seed and dry up, when with a little labour they could be saved and stored. While such hay is not so satisfactory as ensilage (which contains much of the original moisture), it would nevertheless be the means of saving stock during a dry season.

Straw is a food that is much neglected in our wheat-growing districts; while its nutritive qualities cannot be compared with those of hay, its value is very great as an emergency fodder. Although it is appreciated, of course, that even straw that is not stored performs a useful service if it is returned to the soil, it must still be urged that if some of it were saved it would be of incalculable value to the sheep in time of drought. Soaked in or sprinkled with molasses and water, straw will readily be taken by sheep. One owner stated that he fed his sheep on bales of straw which were soaked overnight in a mixture of molasses and water. The excess fluid was drained off and the unopened bale placed in the paddock and sheep ate it readily. Where possible the straw should be steamed immediately before using to make it more palatable. Grain is a necessity with any hay or straw if the sheep are to be kept in condition.

The following paragraphs are taken from the letters received from sheep-owners in the districts mentioned, each paragraph being an extract from a separate letter:—

Northern Plains.—Starting on a small ration of lucerne hay, up to 3 lb. was given daily per sheep. This gave good results. Breeding ewes fared exceptionally well. *Young lambs up to four months did not do well,* developing digestive troubles. Chaff was tried, but was far from successful.

Central Plains.—Lucerne hay I found a failure; all the leaf was broken off in pressing, and no nutriment in the stalks. Best results from oaten hay.

Northern Tablelands.—In 1917 I fed 1,500 weaners on lucerne hay, but it was not a success. They got 1½ lb. per day each, but, although there was a lot of dry feed in the paddocks *we lost* 460 *in sixteen weeks. They were poor when we started to feed and affected with worms.*

I was feeding 350 ewes on lucerne hay during March and April, 1918, allowing 1½ lb. daily. The ewes lambed all right but did *not have much milk,* the result being that all the *lambs that were not old enough to live on hay died.*

I fed lambing ewes on good lucerne hay at the rate of 1½ lb. per head per day. I marked 50 per cent. lambs.

I fed 2,000 sheep on 25 tons of lucerne hay for a few weeks with poor results. The strong sheep took to it readily, and the *poor ones died* before they could eat enough to do them any good, *particularly young sheep.*

I fed 400 ewes while lambing for four weeks on 2 lb. of lucerne hay each daily. The ewes did well and *had plenty of milk* for the lambs.

In 1919 I fed 500 Merino ewes on good lucerne hay—1 lb. per head per day. They did remarkably well. But the *increase all died,* as the *mothers seemed to have no milk after four to five days.*

New England.—Two-hundred weaners and young sheep were fed on red clover hay The sheep kept in strong condition.

Grain.

Feeding on grain was carried out extensively during the past drought. Grain food has many advantages, possibly the most important being that it is concentrated and is easy of transport, but as already pointed out, grain alone is not a good fodder unless the stock can pick up some roughage to make up the bulk of the food. Hay, scrub, dried grass, and leaves all help to keep the digestive organs active, and farmers reporting good results attending hand-feeding with grain usually stated also that some roughage was available.

Generally speaking, maize has given the best results: as a drought food it is superior to other grain. Four ounces daily appears to have been a usual ration per sheep, but this is rather small, and 8 oz. daily is much to be preferred. In other countries, where hand-feeding of sheep to fatten for the market is a routine procedure, maize and lucerne are the most popular articles of diet. Hence it is not surprising that maize and ensilage and maize and lucerne hay have produced good results during the recent drought in New South Wales.

The question of crushing or soaking the maize has also received attention. A healthy adult sheep should be quite capable of masticating the grain without treatment, but where the sheep are young or poor it is advisable to soak the grain so that it may be more easily assimilated. The disadvantage of soaking is that if fed from the ground the dust and dirt adheres to the grain and is ingested. To some extent this may be overcome by soaking in a limited amount of water, so that all the moisture is absorbed. Soaked grain should be fed at once as it will become sour if kept for any length of time. If it is desired to break the maize it should only be cracked—not ground.

The following reports are of interest:—

Fed fifty old ewes on dry grass and maize—Reared forty lambs.

Fed 200 lambs on boiled corn and bran—Loss of only 5 per cent.

Fed 6,000 ewes three months on ½ lb. hay and ½ lb. corn daily—Reared 75 per cent. lambs.

Fed 8,000 ewes on 1½ lb. lucerne hay and ½ lb. corn—Reared 10 per cent. lambs.

Fed 8,000 ewes on lucerne hay and maize—Marked 10 per cent. lambs; lost 12 per cent. ewes.

Wheat was also largely used for hand-feeding during the last drought, but with this, as with maize, some roughage is required. The results were by no means so good as with maize and there was always the danger of the sheep picking up earth and sand with the grain. Soaking the wheat beforehand is not an advantage, unless some medicament (salt, molasses, &c.) is added to the water. It is not so nutritive for sheep as maize and is less economical, and in few cases did young sheep thrive or ewes rear a big percentage of lambs when fed upon it. As with other feeds, adult dry sheep kept in fair condition in many instances.

Experience with oats and barley is somewhat similar to that with wheat. Barley, however, is hard to masticate and should be crushed before using.

The following paragraphs are taken from the reports received from sheep-owners in the districts indicated, each paragraph being an extract from a separate letter :—

Northern Plains.—Corn up to ¾ lb. per day per sheep was given alone and sometimes with chaff. May be good as a change, and no doubt acts well for a short time, but if continued over four weeks is usually attended with losses, especially in young sheep.

One lot of 900 ewes that were dying were fed on corn for ten weeks and marked 75 per cent. of lambs.

Central Plains.—My opinion is that corn is by far the best artificial food for dry sheep and that if given ½ lb. per head per day they can be kept strong, with practically no losses for a considerable period.

Far West.—Fed wheat from troughs. It was not satisfactory.

Northern Tablelands.—Fed 590 crossbred ewes on wheat. Gave 3 oz. first week, and then 4 oz. daily. Fed from June to September. The paddock had been heavily stocked, but some trefoil burr was left. *The loss of ewes was less than normal, but half the lambs died.* I only marked 45 per cent.

Twenty thousand ewes were fed on wheat, 3 to 4 oz. daily, for three weeks, and the quantity then increased to 8 oz. per head daily. Fed by trailing. The ewes did well: loss of 5 per cent. from sand ingested. *Lambing was a failure.* Of opinion that wheat by itself is useless—*the sheep must have something to fill up upon.*

I found that crossbred ewes in lamb kept strong if given 4 oz. of maize daily, also the ewes did better if corn was soaked some time before being used. *I do not like feeding on grain alone,* but *always give the sheep a few leaves of some sort.*

I fed 300 lambing ewes on corn broadcast, ½ bushel a day. I did *not save many lambs, but I saved the ewes.*

I have fed sheep of different ages on corn, broadcasting it. I found large heaps of corn on the sheep camps. *They seem to have trouble in chewing it.*

Four hundred ewes in lamb, *low in condition,* were given 6 oz. of corn daily, broadcasted, costing 1d. per day per sheep. In a short time there *was a marked improvement,* but though *lambing well they make no milk,* and I only *marked twenty-eight lambs.*

In 1918 I fed 150 fat ewes about to lamb which were dying of paralysis. I gave them 3 oz. maize daily, then 1½ oz. After two days they stopped dying. I fed 4,500 travelling sheep on corn, ½ lb. per day each. Losses were only 2 per cent. per month.

Southern Highlands.—Feeds mostly used were lucerne hay, oaten hay, and maize. Of these maize gave the best results. It is easily handled, and sheep took to it readily and picked up every grain, there being no waste. The quantity used varied from ½ lb. to 1½ lb. per day, and the method generally adopted was to divide the sheep into as small lots as possible with the paddocks available, and then just scatter the maize on the ground. One lot of 4,000 sheep fed in this way for two months did well. They were in only two lots, 1,000 of the weakest being separated from the strong ones. They improved during the time they were being fed.

(To be continued.)

Orchard Manuring Experiments at Bathurst.

The manurial experiments which have been carried out at Bathurst Experiment Farm orchard for the last four years have now been concluded. No benefit has been apparent from the use of the manure used (blood and bone broadcasted in quantities varying from 4 to 10 cwt. per acre), and it would appear from the results obtained that the soil at the Bathurst orchard is still sufficiently rich for fruit-growing without manure, providing the rainfall is sufficient. Advantages from the use of manures may yet become apparent.—W. J. Allen.

The Modern Cheese-curing Room.

An Interesting Competitive Comparison.

A. T. R. BROWN, Assistant Dairy Instructor.

To appreciate the effect on quality of cheese matured in a good curing room, one requires to see the difference in quality and weight of the same cheese when ripened in an indifferent curing room.

In one of the cheese classes at the recent Bega show this was the end in view, as well as the placing of every competitor on an equal footing as regards the ripening of the cheese under the same conditions.

On a given date in November, 1920, seventeen of the far South Coast factories forwarded to the Bega Show Committee, a seven-days-old cheese, unbranded, to be marked and forwarded to Kameruka to ripen for three months, each factory at the same time keeping one of the same day's make, and ripening it in the curing room of the factory where it was made.

On the 22nd February, 1921, three months later, the cheeses ripened at Kameruka were judged and awarded points by Mr. C. Davis, formerly Manager of Kameruka Niagara Cheese Factory. The same evening, the factories forwarded the cheeses ripened in their own rooms to the Bega Show Committee, to be examined and have points awarded by the same judge. When comparisons were made, it was found that, with one exception, the cheese ripened at Kameruka scored higher points than those ripened at the various factories. The exception was later on found to have been cured in a local chilling room by mistake.

The results were as follows :—The winning place went to Warragaburra Cheese Factory (W. Riley, cheese-maker), the cheese scoring 94½ points. The duplicate of this cheese ripened at Warragaburra scored 92 points. It is interesting to note that this cheese was made from pasteurised milk. In an unpasteurised entry the cheese from this factory only scored 92 and 91 points respectively.

The second place went to the Elmgrove Cheese Factory (A. Peters, cheese-maker), scoring 94¼ points; its duplicate ripened at Elmgrove scored 92 points.

The third place was divided by Erinna Co-operative and Moruya Co-operative Cheese Factories, scoring 94 points each. The duplicates of these scored 93 and 92 points respectively. It is interesting to note that the Moruya cheese was made from pasteurised milk.

The competition was carried out in the three most trying months of the year to test the effectiveness of the different curing rooms, and the result of the competition fully warranted this step. Erinna curing room gave test results next Kameruka, but there was a marked difference between the quality of the cheese ripened at some of the smaller factories.

The far south has always prided itself on the consistent and uniform quality of cheese that some of its factories turn out. Giving only due praise, pride of place in this respect should go to Kameruka Estate, and on sifting out the reason for its success, it is apparent to both the expert and casual visitor that it is due to cleanliness at the dairies, solid application and adherence to detail in manufacture, and lastly, to the consideration given to ripening the cheese in a proper curing room where a system of control gives an almost even temperature throughout the year. It was for this reason that the Kameruka rooms were chosen to carry out this scheme.

The new cheese suffered most in December when there was a general heat wave for a few days ; I had the opportunity of visiting some of the factories storing the duplicate cheeses, and the temperature of several of these rooms ranged up to 90 degrees Fah. The texture of the cheese stored in these rooms suffered accordingly, the cheese also loosing unduly in weight. The Kameruka rooms were barely affected by such heat, partially on account of the use made of a sub-earth air vent for creating an underground draught in the curing room. When used with discretion most beneficial results are obtained from this device, and I fail to see why so few factories use it, when they are so favourably situated to have the device built in.

The result of the competition gives a two-fold lesson ; first, that better cheese results from even maturing in a properly insulated room holding an even temperature ; secondly, that for mixed milk as in co-operative factories, pasteurisation greatly assists in giving uniform quality.

On account of the Kameruka rooms being used for the competition, the Kameruka Estate did not put an entry in.

Grass and Clover Plots at Orange.

Reporting in the middle of April with regard to certain grasses and clovers that were sown on his property last spring, Mr. W. Brown, "Avondale," Orange, remarked that the autumn growth was well advanced, and those likely to provide good winter pasturage were to some extent indicated.

The most promising of all the grasses for winter feed was Toowoomba canary grass (*Phalaris bulbosa*), which Mr. Brown considered the best winter grass in the Orange district.

Tall oat grass (*Avena elatior*) and giant fescue (*Festuca arundinacea*) were giving good results, as were cocksfoot, Kentucky blue, and perennial rye. A plot sown with a mixture consisting of 8 lb. giant fescue, 4 lb. tall oat, and 3 lb. white clover looked particularly good.

Of the clovers, ladino (*Trifolium repens* var.), an improved type of white Dutch clover, was showing considerably greater growth than the ordinary white Dutch. Chilian clover (*Trifolium pratense perenne*) was very bulky, and carried a lot more growth than Bokhara clover (*Melilotus alba*).—J. N. Whittet, Assistant Agrostologist.

A New Method for Determining Yields of Experiment Plots.*

H. WENHOLZ, B.Sc. (Agr.), Inspector of Agriculture.

In the establishment of crop experiments with varieties, fertilisers, &c., a piece of land is chosen if possible which is, on appearance, uniform throughout. It is, however, difficult to say definitely, even though appearances indicate it, that the whole of a field is identical in fertility, and in the many other factors which affect yield. That is to say, that if a certain field of several acres were sown throughout to the same crop and given the same treatment right through, and then divided into plots or sections of equal area, each of which was harvested separately, the yields of these plots would show unexpected differences, which must largely be caused by invisible differences in the soil.

In a comparative experiment in which, say, several fertiliser mixtures are being tested, one or more plots with no fertiliser are included as "comparison" or "check" plots. If these check plots are few in number in comparison with the total number of plots in the experiment, they will be widely distributed, and there is likely to be found a comparatively large variation in their yields, due to lack of uniformity in the land. If the check plots are frequent and systematically distributed throughout the experiment, the differences between adjacent check plots will not usually be so great.

With comparatively few check plots it cannot reasonably be assumed that the soil varies uniformly between them, but with frequent check plots—say alternately or every third plot—this assumption cannot be considered to be inordinate. Alternate check plots are the ideal, but as this frequency increases the area for the experiment (which is often limited) or decreases the size of each plot in the test (which is also inadvisable on account of its greater probable error), a wider distribution of the check plots to every third or fourth plot is most often used. Where the land is carefully selected in the first place, and with long narrow plots, the system of having check plots every third plot may be considered to be sufficiently accurate in most cases to assume that the land varies uniformly between these check plots. The method used, then, to show the difference between the various plots in the test, is seen from the following example :—

No. of Plot.	Treatment.	Yield per acre.
		bushels.
1 (*check*) ...	No manure	70·5
2	½ cwt. superphosphate per acre...	79·35
3	1 ,, ,, ,, ...	79·65
4 (*check*) ..	No manure	66·0
5	1½ cwt. superphosphate per acre	77·76
6	2 ,, ,, ,, ..	77·5
7 (*check*) ...	No manure	60·0

*Paper read before the Agricultural Section of the Australasian Association for the Advancement of Science, Hobart, 1921.

Without consideration of the check plots, the yields appear to be in order of merit as follows :—

Treatment	Yield per acre in bushels.
1 cwt. superphosphate...	79·65
½ ,, ,, ...	79·35
1½ ,, ,, ...	77·76
2 ,, ,, ...	77·5
No manure (average of 3 plots)	65·5

To express the results in this way is obviously wrong, for judging by the yields obtained from the check plots, the land becomes slightly less fertile as we proceed from Plots 1 to 7. The result is that the 2 cwt. superphosphate plot is situated on less fertile soil than the 1 cwt. superphosphate plot, and cannot make an actual yield equal to it. Some correction must be applied to obtain correct comparative yields. With the justifiable assumption, then, that the land varies uniformly between the check plots under the aforesaid conditions, the "natural" yields of the plots are seen from the following :—

No. of Plot.	Actual yield per acre.	Natural yield.
	bushels.	bushels
1 (*check*) ...	70·5	70·5
2	79·35	69·0
3	79·65	67·5
4 (*check*) ...	66·0	66·0
5	77·76	64·0
6	77·5	62·0
7 (*check*) ...	60·0	60·0

Taking these figures, some of the American experiment stations give the increase (or decrease) due to treatment as the difference between the actual and the natural yields for each plot. It is apparent, however, that this difference cannot be regarded as strictly comparative, as it depends not only on the actual yields obtained, but on the location of each plot in the experiment. The only true method of comparing the results due to treatment is to compare the "percentage yields"; that is, the percentage the actual yield is of the natural yield of each plot.

This is given as follows :—

No. of Plot.	Actual yield per acre.	Natural yield.	Percentage yield.
	bushels.	bushels.	
1 (*check*)	70·5	70·5	100
2	79·35	69·0	115·0
3	79·65	67·5	118·0
4 (*check*)	66·0	66·0	100
5	77·76	64·0	121·5
6	77·5	62·0	125·0
7 (*check*)	60·0	60·0	100

From this it is seen that the order of merit of the different methods of treatment is:—

Treatment.	Percentage yield.
2 cwt. superphosphate	125 0
1½ ,, ,, ...	121·5
1 ,, ,, ...	118·0
½ ,, ,, ...	115·0
No manure	100·0

This method of presenting the results of an experiment has been used by the New South Wales Department of Agriculture for many years, but it has two serious drawbacks. Although presenting the results in their correct order of merit, there is no means of determining the profit per acre due to any treatment. Again, the column of percentage yields, which really determines the comparative merits of the different treatments, is difficult to understand by many farmers who look to see the yields in amount per acre. As previously shown, a wrong conclusion is arrived at by farmers who follow this column of actual yields per acre.

The problem, then, is to give the results in yield per acre, and, at the same time, express them in strict comparison and due order of merit. To do this, it is apparent that the computed yield per acre for any treatment must be based on the percentage yield of that plot. It is seen that 2 cwt. of superphosphate per acre gives an increase of 25 per cent. over no manure. How can this be expressed in bushels per acre? This is of importance, for the two reasons given above; but, also, if such an experiment is continued over a series of years, the average yield per acre for each treatment must be given. Obviously, the actual yields per acre cannot be averaged, as they ignore the check plots and are wrong; nor can the percentage yields be averaged, because the high yields per acre of a good season would not exert their just influence on the average.

Now, the average of the natural yields throughout an experiment really represents what the plot of ground would have yielded per acre if it had been sown throughout to the check plot—in this instance, no manure 65·6 bushels per acre. Also, the yield which would have been obtained from each treatment if sown over the whole land on which the experiment was conducted is the percentage yield of the plot multiplied by this average of the natural yields and divided by 100. In the example under review, the results of the experiment are, therefore, as follows:—

Treatment.	Yield per acre.
2 cwt. superphosphate ...	$\frac{125\cdot0}{100} \times 65\cdot6 = 82\cdot0$ bushels.
1½ ,, ,, ...	$\frac{121\cdot5}{100} \times 65\cdot6 = 79\cdot7$,,
1 ,, ,, ...	$\frac{118\cdot0}{100} \times 65\cdot6 = 77\cdot\frac{1}{2}$,,
½ ,, ,, ...	$\frac{115\cdot0}{100} \times 65\cdot6 = 75\cdot4$,,
No manure	65·6 ... ... 65·6 ,,

If the difference between the actual and the natural yields is taken to be the increase in yield due to treatment (as is done by many American experiment stations), we have in this instance an increase of 15·5 bushels per acre due to the application of 2 cwt. superphosphate.

By this new method of expressing the results, this same increase is 16·4 bushels per acre. This difference is caused by the fact that the 2 cwt. superphosphate plot was situated on slightly less fertile soil than the average of the area on which the experiment was conducted. The latter figure (16·4 bushels increase) must be considered more exact, for it represents the average increase obtained on the average of this area.

This method of computing the results of experiments, with a slight modification, has been officially recognised by the Experiments Supervision Committee of the New South Wales Department of Agriculture, and the results of all future experiments of this Department will be computed in this way. The modification referred to consists in taking the average yield of the check plots, instead of the average of the natural yields throughout the experiment, and computing the acre yields as before.

In the different States of Australia where check plots are used at varying intervals in experiments, some uniform system is needed for evaluating the published results, especially as experiments by one State may be expected in some cases to apply to neighbouring portions of another State, and because different conclusions may be arrived at according to the methods employed in computing the results.

Feeding Syrup to Bees.

When dwindling is noticeable in a colony, the best syrup to feed to the bees is sugar and water in equal quantities by volume, stirred and brought to the boiling point, and fed warm (not hot) to the bees inside the hive.

A good method used in feeding is to remove one or more empty combs, and pour the syrup into the cells with a sprinkler, such as a tin with holes in the bottom. The combs so filled are then replaced in the hive. The work is usually carried out toward the late afternoon, and the filling of the combs is done indoors.—W. A. Goodacre, Senior Apiary Inspector.

More Experience with Kikuyu Grass.

Mr. J. T. Robilliard, Tingha, described his experiences to date with Kikuyu planted last August thus:—"This grass stood the dry weather remarkably well, and held its own against the summer grass. The stock eat it readily. Some roots were also planted in a poultry run, and though the fowls gave it a very bad time, the majority of the grass is still alive. I am still planting roots of Kikuyu in the grazing paddocks, where, notwithstanding the dry and hot spell, it seems to take readily. I should say it would be an ideal pasture grass for sheep. So far it has had no frosts on it, and I am waiting to see how it will stand our rather severe winter. . . . . Mine was planted on sandy (granite) soil."

The Cause of Black Disease and its Method of Transmission.

Being Further Studies in a Braxy-like Disease of Sheep.

[Continued from page 402.]

SYDNEY DODD, D.V.Sc., F.R.C.V.S., Lecturer in Veterinary Pathology and Bacteriology, Veterinary School, The University of Sydney.

The Causal Organism of Black Disease.

Morphology.—The organism is one of the larger sporing bacilli. Its length varies considerably, depending on the element on or in which it has been growing. Its breadth is, however, fairly constant. In the natural hepatic lesions its length is from about 4 to 8 microns, with numerous filamentous elements up to 60 microns, without apparent division. The length of the majority of these filamentous forms is, however, about 30 microns. Occasionally chains composed of three or four shorter elements are encountered, but single rods are in the majority. The ends are distinctly rounded. The breadth is about 0·8 to 1 micron. Scattered among the before-described forms may be seen here and there short bacilli, about 2 microns long, and also even what at first sight appear to be coccus-like elements. These latter, as already stated, are merely the ends of the longer rods, standing at right angles in the section. The short rods are the ordinary bacilli lying obliquely to the line of vision in the section, as may be readily demonstrated by altering the focus of the microscope, the rest of the rod then coming into view, whilst the former part disappears. The filamentous elements are almost always to be found arranged around the periphery of the lesion—often in masses—near the leucocytic zone. The bacilli scattered throughout the body of the lesion are of the shorter type.

In cultures the bacilli usually occur singly or in pairs. No chains are formed, and only an occasional filamentous element is seen. In liquid media their length is from about 4 to 7 microns, and their breadth from 0·8 to 1·2 microns. Occasionally rods up to 10 microns occur, but they are seldom less than 4 microns long. In primary cultures from the muscle of inoculated sheep in serum-formate broth, bacterial forms up to 17 microns long are frequently seen. Involution forms often occur when the media or surroundings are unfavourable. In smears taken from the local lesion of experimentally infected animals the bacilli vary from 2·5 to 7 microns in length, but their breadth, as in other cases, remains fairly constant, viz., about 1 micron. The longer bacillary forms predominate but there are no chains or filamentous elements. The organism is non-motile.

Spores.—These are almost invariably situated terminally or sub-terminally, and are distinctly oval, measuring about 1·75 to 2·75 by about 1·25 microns. They distend the bacillary rod. Spores are not often found in the lesions if the latter are fixed directly after death, but they will be found if there has been a few hours delay in fixation. They are readily formed in media containing serum, but very few in any media containing glucose.

Staining reactions.—The bacilli stain with any of the basic aniline dyes and are Gram positive; but in sections, if the tissue has been preserved any length of time, the contained bacilli cease to retain the stain by the method of Gram or Gram-Weigert, or retain it only feebly. By the Claudius method they stain a deep purple. For the demonstration of the bacteria in sections, the latter has been the method of choice, as the decolorisation of the tissue elements can be carried to a considerable length without decolorising the organisms. In sections also, the Giemsa and Kühne-Nicolle methods have given good results, but more care has to be observed in the manipulation.

Occurrence in the body.—In naturally occurring cases, if the autopsy be held immediately after death, the baccilli will be found confined to the hepatic lesion or lesions. The unaffected liver tissue, other organs, exudates, blood, &c., appear to be quite free from them, even on cultivation. Consequently the condition is really a toxæmia. There is every reason, however, to believe that invasion of the adjoining liver tissue, and possibly the blood, may take place soon after death, together with invasion from the intestines of cadaver bacilli. Invasion by the latter, of course, invariably occurs unless the tissue is removed directly the animal dies. In two cases where the post mortem was unavoidably delayed for about an hour, microscopical examination of the affected liver showed that the bacilli in the necrotic lesion had already begun to extend through the zone of reaction into the unaffected liver substance.

In experimentally infected cases, the disposition of the causal organisms depends upon the method of introduction. When inoculated subcutaneously, the bacilli are found in greatest number in the neighbourhood of the inoculation site. If the injection has been made intramuscularly, they will be found numerously present in the inoculated muscles, but very frequently the subcutaneous exudate immediately in their vicinity may be very scanty in bacilli. Although this exudate may be abundant, and the causal organisms numerous in it around the site of inoculation, it is, nevertheless, difficult by the microscope to find bacilli at any considerable distance from this area, and at times in such cases even cultural methods fail to reveal them. The thoracic, peritoneal, pericardial, and intermuscular exudates (when the latter occurs some distance from the inoculation area) when present in such experimental cases are bacteria free.

Cultural Characters.—This description, as noted in the footnote on page 397, is incomplete, and relates mainly to culture in liquid media. The bacillus is an anærobe, and grows best at body temperature, but, like other anærobes,

can be grown ærobically by adopting Tarozzi's method or one of its modifications. Nissa's liver-piece broth has been found very convenient, with a slight modification as follows:—The minced liver is placed, whilst fresh, in the tubes or flasks, instead of being previously boiled. A sufficient quantity of bouillon is then added, and the tubes, &c., sterilised in the usual manner. The medium, which has coagulated into a solid mass, is broken up by means of a sterile glass rod, and, just prior to inoculation, the tubes are boiled for a short time to drive out the air which gains entrance during the storage of the tubes, the latter being cooled immediately before actual inoculation. Growth in such medium is more abundant than if the liver is cooked before it is placed in the tubes. In this medium the bacillus grows well, spores form readily, and the virulence is maintained for some months without the need for re-inoculation of cultures, provided, of course, that fresh sub-cultures are made when required for animal inoculation.

Serum broth.—Growth is abundant in this medium, and usually complete in from twenty-four to thirty hours. The growth settles at the bottom of the tube in a flocculent mass. Spores are readily formed. In plain broth the growth is very scanty. There is no gas formation.

Glucose-serum broth.—Growth is abundant, but very few spores are formed—and the culture soon dies out. Cultures in media containing glucose soon lose their virulence, and then even large amounts fail to infect. In glucose there is a little gas formation.

Liver-piece broth.—Growth in this medium is abundant, whether under oil, or exposed to the air, and is complete in twenty-four to thirty-six hours. Numerous spores are formed. The production of gas is considerable. It has a peculiar but not putrefactive odour. The medium is rendered very acid.

Milk.—Grows well. The milk commences to peptonise in twenty-four hours. There is little gas formation. In forty-eight hours the whole of the milk is peptonised, leaving a cloudy, whey-like fluid with loose clot-like deposit. The odour is most unpleasant.

Alkaline egg broth.—Growth is profuse. There is no gas formation. Spores are formed freely. A thick deposit of bacteria forms at the bottom of the tube.

Brain broth.—Grows freely, but the medium is not blackened.

Cultures in liquid media can be readily obtained by floating about half an inch of soft petroleum or liquid petroleum on the surface of the tube before sterilisation. Such, however, does not form a permanent air seal, and the tubes must, therefore, be boiled just prior to inoculation in order to drive out the infiltrated air. Olive oil was not used as an air seal, because it has been found to be quite inefficient for that purpose.

Glucose-agar stab culture.—Growth is evident in less than twenty-four hours along the needle track. No lateral branching is seen. There is a moderate amount of gas formation, and the medium is soon shattered. There is little or no spore formation, and the culture soon dies out.

Experimental.

In the previous article I dealt with the numerous inoculation experiments upon various animals, made during the investigations from 1914 to 1917, with a variety of materials taken from sheep dead from black disease, and also with bacteria isolated from different situations, some of which were pathogenic and others non-pathogenic. Of the former, it was shown that no matter how virulent the organism on par-enteral inoculation, the value of the conclusions was quite nullified unless it could be shown that the particular organism had been present in the body (in the strict sense of the term) before death. Consequently, deductions based upon experiments made with bacteria isolated from sheep "found dead," particularly anaerobes, could have very little weight.

The present account of experimental work deals with the bacillus considered by the writer to be the causal organism of black disease, isolated in pure culture from various necrotic foci in livers of sheep affected with that condition, the tissue having been removed immediately after the death of the animal. To obtain such tissue, the usual procedure was followed, viz., the particular flock of sheep, usually numbering two or three thousand, in which cases of black disease were occurring, was closely watched and followed about the paddock in which they were grazing. Immediately an animal was observed sick, it was kept under closer observation for a variable period. Usually, however, as soon as it was seen to be seriously ill, it was caught, placed in a vehicle or on a horse, and taken to the spot arranged for conducting the autopsies. Here again the animal was sometimes kept under observation for a variable period, and at other times was killed at once.

During the course of the field investigations, lasting about six years, sheep have been killed in various stages of the disease. One has not always waited until they were *in extremis*; not infrequently the animal has died whilst being transported from the paddock to the post mortem shed, often a journey of only a few minutes. Yet, although the flock had been closely watched, the animal had only a short time previously been singled out from its fellows as being ill. This difficulty of picking out a sheep before it is seriously ill, from a flock of sheep kept under Australian conditions, has already been commented on by the writer.

Such specimens as were required were taken from the animal immediately it had died naturally or had been killed. Rigid precautions were taken to prevent contamination of the materials during the process. Instruments, test-tubes, specimen bottles, etc., were all previously sterilised by the autoclave in the laboratory before leaving, because in an open paddock, no matter how long one boiled instruments in the field, there might be a possibility that complete sterilisation had not been effected, owing to the vessels in which the sterilisation was conducted being exposed to dust, etc., during boiling. This rendered one's baggage both bulky and heavy, but it had the crowning merit of certainty as regards sterility of instruments, &c.

Selected portions of organs, etc., were placed in test-tubes, wide-mouthed specimen bottles, etc., with the usual precautions, and taken back to the laboratory for further work. Even after the utmost care some of the tubes or bottles were subsequently found to be contaminated, no doubt by air-borne organisms that gained entrance as the specimen was being placed in the receptacle. Any such were rejected. As a rule, with every visit to the affected localities during the season, one could always rely on obtaining sufficient uncontaminated material for subsequent experimental work in the laboratory.

In this experimental work, sheep of any age over nine months were employed. The usual sites of the inoculations were the subcutaneous tissues of the insides of the thighs, chest and neck ; also the muscles of the former. The inside of the thigh was preferred, however, on account of the ease with which one could watch the development of the lesion clinically, it being naturally devoid of wool, and capable of being manipulated post mortem with least fear of accidental contamination of the exposed tissues. With the rabbit and guinea-pig, the inoculations were made subcutaneously and intramuscularly, usually into the thigh. In the fowl and pigeon the sites were the pectoral muscles.

Young sporing cultures about twenty to twenty-four hours old were usually employed; either in serum-formate broth or liver-piece broth. The cultures from which these inoculation sub-cultures were made might, however, be some months old.

In cases autopsied immediately after death, the bacilli could be recovered in purity from the local lesion and the exudate around it. In the following notes on the experimental inoculations, it may be accepted that unless the contrary is stated, the purity of the organisms from lesions so produced was tested microscopically and culturally, and at times by inoculation into another animal. In quite a number of cases it happened that no matter what care was taken to regulate the dose of culture and the time of inoculation, the animal would be found dead upon one's arrival in the morning. In the case of sheep, although in some instances it was evident that death had not long ensued, post mortem invasion by other organisms had already taken place, so that bacteriological work on that particular animal was rendered quite nugatory on account of the character of the organisms being experimented with, although the lesions themselves were not masked by post mortem phenomena. In the case of the smaller animals, those not killed or not seen to die were discarded, and not used in the compilation of experimental data or the drawing of conclusions.

Sheep.

The administration of relatively large amounts of young, virulent, sporing cultures by the mouth has quite failed to produce any evidence of reaction, although a number of methods were employed to facilitate the action of the organism and to prevent its destruction by the digestive agencies of the animal. This is quite in conformity with the feeding experiments made with minced organs, viscera, etc., of naturally affected sheep, as previously

recorded. Subsequent inoculation experiments with sheep that had been drenched with cultures, indicate that the administration of virulent material by way of the alimentary tract confers little or no immunity.

Subcutaneous and Intramuscular Inoculation.—Small doses up to 0·25 c.c. produce in the sheep considerable local and systemic disturbance, but are not always fatal. The latter amount will frequently kill, but the result is not constant. Doses of from 0·5 to 1·5 c.c. of culture are almost invariably fatal to sheep of any age in from about twenty-eight to seventy-eight hours, usually in less than forty-eight hours. Sheep that survive experimental infection for three days often recover. With subcutaneous inoculation there is, about fifteen hours afterwards, considerable swelling around the site of injection, which gradually extends, at first mainly in a downward direction (gravitation). If the injection be into a limb, the swelling gradually reaches the coronet. As the condition progresses pronounced lameness appears, the animal often carrying the affected leg. The swollen part in the early stage of the disease is œdematous, and pits readily on pressure ; later on it becomes firmer. There is no noticeable gas formation. For a while the skin itself shows no sign of change, but about twenty-four hours after the injection a small livid spot appears at the point of entrance of the needle. The lividity gradually spreads, its actual extent appearing to depend upon how long the animal survives. If death occurs in about forty hours, it may be only about half an inch or so in diameter. If the animal lives longer, the area may extend several inches around the needle puncture. In cases where a slightly attenuated culture (artificially attenuated) has been employed, and the animal has survived, a very pronounced livid area of varying extent appears at the inoculation site, succeeded by necrosis of the overlying skin.

There is a moderate hyperthermia (about 105 deg. Fah.), with the usual clinical manifestations of profound systemic disturbance. Later, the animal becomes very quiet, and readily permits itself to be handled, or may even refuse to move. At this period, however, the mental faculties do not appear to be impaired. In the final stages the animal becomes comatose and dies very quietly.

Post Mortem Appearances.—If the autopsy has been made immediately after death, the most striking changes are observable in the inoculated area. In the case of injection into the thigh, the wool is easily pulled out of that limb. An œdematous swelling extends downwards to the coronet and upwards to the groin. At times, however, the upward extension of the swelling is absent. At others, the upward extension, instead of gradually diminishing, terminates abruptly. Possibly this is the effect of gravity on the contained exudate.

As already remarked, there is a larger or smaller area of lividity around the point of inoculation. If death has ensued soon after the injection, this area may be minute. If the animal has survived two days or so, the subcutaneous tissue in the inoculation area is considerably thickened, and shows evidence of necrosis. The subcutaneous tissues of the swollen part are saturated with an odourless exudate, which, near the inoculation site, is often

blood-tinged, but elsewhere is clear and straw-coloured. At times this exudate may be found reaching to the floor of the abdomen, and even infiltrating the inter-muscular tissues of the abdominal muscles. On a few occasions the perirenal tissue was also found saturated with this exudate. There is no evidence of gas formation.

Bacilli in purity may be found fairly numerously around the site of inoculation, but they are extremely scanty in the subcutaneous exudate at any distance from this area, and their presence there often can only be demonstrated by cultivation. At times even this fails, especially in the case of the exudate in the abdominal floor and other such distant sites. If the injection has been made intramuscularly, the reaction is more severe, although at times the swelling of the limb is not so pronounced.

In addition to the phenomena mentioned as resulting from subcutaneous inoculation, the muscles around the inoculation site are very dark and may show a number of hæmorrhages. On incision of the affected muscles there is a distinctly unpleasant odour, but not exactly that of putrefaction. There is no evident gas formation. Parts of the muscle appear at times to have a greyish necrotic character. Others in the immediate vicinity may show a few small hæmorrhages scattered throughout their substance. The affected muscles are infiltrated with a blood-tinged odourless exudate.

Occasionally there may be some clear exudate in the peritoneal or pleural cavities, but as a rule there is none. Almost invariably, however, the pericardium is distended with a clear, straw-coloured odourless fluid, which, like other exudates, coagulates spontaneously. It is bacteria free. If the heart, blood and organs are examined immediately after death they also are found free from bacteria. Frequently the heart shows endocardial hæmorrhages. The liver, kidneys and spleen are congested, but not enlarged. Sometimes, but not often, one may see on the surface of the former dirty, greyish-white areas of commencing necrosis, with ill-defined margins. Usually there is some more or less pronounced œdema and congestion of the mucosa of the abomasum and small intestines, but no ulceration. The lymphatic glands of the inoculated limb, and of the trunk also, are congested and swollen. There are no naked eye changes in the lungs.

Guinea-pigs.

With virulent, young cultures, doses of 0·1 c.c. injected subcutaneously are usually fatal in about twenty hours. With smaller doses of 0·02 to 0·05 c.c., the animal may live for about three days. In all cases, however, the lesions are fairly constant, viz., considerable swelling of the inoculated thigh, the skin being tense and sometimes livid. The subcutaneous tissues of the inoculated leg are saturated with a slightly turbid, odourless exudate. There is no gas formation. The subcutaneous exudation extends forward along the abdomen for some considerable distance, often as far as the axillæ. It is more abundant on the inoculated side of the body. Around the point of injection, the subcutaneous tissues show varying degrees of thickening according to the duration of the disease. The muscles in the same area have

in parts a greyish appearance of commencing necrosis, and in others a pronounced inflammatory congestion. They are not often actually hæmorrhagic. On section, if the injection has been intramuscular, the injected muscles have an unpleasant but hardly putrefactive odour. Occasionally, there may be a slight amount of exudate in the peritoneal or pleural cavities, but this is not the rule. The spleen, kidneys and liver are congested, and if the disease has lasted twenty-four hours or more there are very occasionally either ill-defined or circumscribed dirty-white areas of commencing necrosis in the latter, about an eighth of an inch in diameter. The stomach and small intestines are as a rule deeply congested, but there is no ulceration. The mucosa is œdematous, and the contents of the small intestines usually a straw-coloured, clear fluid. The pericardium is almost invariably distended with a clear, colourless exudate. As a rule the causal bacteria are confined to the neighbourhood of the site of the inoculation and the subcutaneous exudate of that region, from which they can be recovered in purity, but the further the exudate is from the local lesion, the more scanty become the bacilli.

Rabbits.

Small doses of from 0·1 to 0·2 c.c., such as would be sufficient to kill a guinea-pig are not fatal. Very frequently no reaction at all is to be seen. Larger doses, viz., 0·25 to 0·5 c.c. subcutaneously, usually result in death. In a number of instances, even with such increased amounts, death may be delayed until the fortieth hour after injection. Beyond pronounced lameness, there are few clinical symptoms to be observed until near the fatal termination.

Lesions.—There is practically no swelling round the point of inoculation, no cutaneous changes and no gas formation. The subcutaneous tissues in the inoculation area are moderately infiltrated with an exudate, slightly blood-stained near the point of injection, but colourless elsewhere. There is no odour. The superficial muscles in this region are slightly reddened, but there are no hæmorrhages. Frequently there is a considerable amount of exudate in the pericardium but no gross lesions elsewhere. The bacilli can be recovered in purity from the inoculation area, but they are not obtainable elsewhere.

The Fowl.

Doses of 0·2 c.c. of virulent culture injected intramuscularly are usually fatal, but death does not occur under about forty hours or longer. Here, again, there are few clinical signs of reaction, the bird looking apparently well until near the end. Death ensues rapidly and quietly once symptoms are manifest.

Lesions.—There are no marked cutaneous changes. The subcutaneous tissues for some distance around the point of inoculation are saturated with the usual inflammatory exudate. Near the point of entrance of the needle, it is slightly blood-tinged, but some distance away, colourless. These tissues also show evidence of necrosis. There is, however, no unusual odour and no gas. The muscles in the inoculated region and for some distance around, have a greyish-white appearance of commencing necrosis, most pronounced

along the needle track. There is no unusual odour in the incised affected muscles and no hæmorrhages. No other gross lesions have been observed save moderate congestion of the mucosa of the small intestines. The bacilli are recovered in purity from the inoculation area, but elsewhere is bacteria free.

The Pigeon.

This bird is as susceptible to artificial infection as the guinea-pig. The intramuscular injection of 0·1 c.c. of virulent culture is usually followed by death in about eighteen to twenty hours. On autopsy no cutaneous changes are evident. The subcutaneous tissues of the breast and abdomen are infiltrated with the usual exudate. There is no odour or gas formation. A distinctly necrotic line follows the needle track and extends laterally for a short distance into the muscles, the lateral extension being irregular in width. At the edges of this necrotic zone the muscles show evidence of intense inflammatory congestion, but there are no distinct hæmorrhages and no gas. On incision, the odour of the affected muscles is rather unpleasant but not distinctly putrefactive. No other gross lesions have been observed. The bacilli are confined to the lesions from which they have been recovered in purity.

Up to the present, no experimental inoculations have been made into the horse, ox or pig.

(*To be continued.*)

Gravenstein Grafts at Bathurst.

In the year 1914 attention was directed to a particularly fine Gravenstein apple-tree that was growing in a private orchard at Cattai. The tree had never shown any signs of twisting and had carried up to 25 bushels of fruit. A few scions and roots were obtained and sent to Bathurst Experiment Farm, where they received very careful attention, but owing to the roots having been taken from a very old tree they did not develop rapidly. The scions were grafted on to another apple-tree. The grafts on this tree did not twist, but as there were no records to show what stock this tree was grafted on to in the first instance, scions were taken from the grafted tree and worked on to a Gravenstein tree that twisted badly. The Gravenstein was cut off below where it was grafted and according to the orchardist at the farm, these later grafts are now twisting also. It seems to indicate quite plainly that twisting is simply a stock trouble, and that the scions taken from the tree from Cattai were worked on a seedling. So far, the trees that were worked on the roots are not showing any signs of twisting.—W. J Allen.

There is nothing so good as poisoned bran for taking the hop out of a grasshopper, and there is no better way of buying and distributing the bran than through a community organisation . . . . . Fighting a grasshopper invasion without the help of the neighbours is like trying to put out a fire in a powder factory with one bucket of water.—The *Weekly News Letter* of the U.S. Department of Agriculture.

Pure Seed.

Growers Recommended by the Department

The Department of Agriculture publishes monthly in the *Agricultural Gazette* a list of growers of pure seed of good quality of wheat, oats, maize, sorghum, Sudan grass, potatoes, and other crops, in order to encourage those who have been devoting attention to this sphere of work, and to enable farmers to get into direct touch with reliable sources of supply of such seeds.

The list is compiled after inspection of the seed and report by a field officer of the Department (preferably during the growth of the crop), and farmers who have pure high-class seed of good quality of any variety of farm crop are invited to communicate with the Under Secretary and Director, Department of Agriculture, Sydney.

The Department does not undertake to buy any of the seed.

**Sudan Grass* :—	
	Manager, Experiment Farm, Cowra.
	Manager, Experiment Farm, Temora.
	J. Cavanagh, Curlewis.
Clovers :—	
Shearman's Clover (roots)	J. H. Shearman, Fullerton Cove, Stockton.
Maize :—	
U.S. 133	P. Gersbach, Farm 330, Leeton.
Golden Glow	J F Chick, Hillview, Tenterfield.
Early Yellow Dent	Manager, Experiment Farm, Glen Innes.
Silvermine	Manager, Experiment Farm, Yanco.
Funk's Yellow Dent	J. Ditzell, Lansdowne, Inverell.
	Manager, North Baugaroo Stud Farm, Canowindra
Boone County White	J. Chittick, Kangaroo Valley.
Leaming	Manager, Experiment Farm, Grafton.
Golden Beauty	R. Richardson, Mondrook, Tinonee, Manning River.
Manning Pride	S. Smith, Karaak Flat, via Wingham.
Golden Nugget	J. W. Smith, Wauchope.
Manning White	A. McM. Singleton, Henley, Sydney.
Red Hogan	Principal, H. A. College, Richmond.
Craig Mitchell	W. D. K. Humphries, Muswellbrook.
Early Clarence	F. T. Dowling, Tumut.
Improved Yellow Dent	Manager, Experiment Farm, Grafton.
	D. J. Dorward, Fayfield, Cundletown.
Potatoes :—	
Satisfaction	O. E. Silk, Nimmitabel.
	J. D. Morse, Black Mountain.
Surprise	O. E. Silk, Nimmitabel.
Peanuts :—	
White Spanish	Manager, Experiment Farm, Grafton.
	Manager, Experiment Farm, Yanco.
Virginia Bush	Principal, H. A. College, Richmond.

In addition to those tabulated a number of crops were inspected and passed for purity, but as the growers failed to forward samples their seed has not been listed.

* With regard to Sudan grass, it should be noted that though listed above, it should not be sown unt spring.

A Substitute for Pollen.

No trading is done with natural pollen (pollen stored by bees), but during a pollen shortage (when bees raid the pollard, flour or bran bins), a substitute in the shape of rye flour is fed for a limited period. Rye flour is so far the best known substitute. It is placed in small quantities daily in a number of trays that are protected from the weather and set about the apiary. Another method is to knead the flour with sugar and honey into a stiff paste, and place it over the frames or plaster it on to an empty comb.—W. A. Goodacre, Senior Apiary Inspector.

Poultry Notes.

JULY.

JAMES HADLINGTON, Poultry Expert.

THE principal work for this month will consist in hatching and rearing, advice upon which has been given from time to time in these notes, and also in the leaflet "Rearing and Feeding Poultry," copies of which are available free on application. This being the case, I think we can afford to devote this month's space to giving readers some account of events at the Poultry Conference at Hawkesbury Agricultural College on 18th June.

THE POULTRY CONFERENCE.

The Minister for Agriculture, the Hon. W. F. Dunn, M L A., was present and took the chair—a circumstance which the conference much appreciated. In his opening address the Minister took the opportunity to welcome Mr. Southee, the new Principal of the College, doing so in very cordial terms. Proceeding to deal with the competition itself, he remarked that during last year, despite the strained financial position, he had provided funds for netting in the tops of the pens to prevent losses from crows, &c. It had been brought under his notice that a further desirable improvement was to provide concrete floors in the houses in the competition sections, and he had given instructions that estimates of cost were to be prepared, and as the finances improved he would give careful consideration to the question of carrying out this work.

During the year there had been much pessimism among poultry-farmers as to the large number of persons who were going out of the business, as a result of the high cost of feeding and the difficulties experienced in procuring mill offal for the morning mash. Statements had been made to the effect that a very large reduction in stock had resulted, variously stated at 20 per cent. to 40 per cent. On this point, it was satisfactory to find that notwithstanding several adverse circumstances the value of our products had increased from £2,501,000 in 1919 to £2,814,000 in June, 1920. These figures were made up as follows:

Value of Eggs ...	...	£2,169,000
Table Poultry ...	...	645,000
Total...	...	£2,814,000

According to figures made available by the Government Statistician, the present poultry flocks of New South Wales were double those of 1913, so that the industry was in a most satisfactory position compared with other parts of the world. As a case in point it might be mentioned that in 1919, five years after the war began, which should furnish a safe basis on which to make comparisons, the imports to the United Kingdom had dropped 90 per cent. in the case of eggs, and over 80 per cent. in table poultry.

Reverting to the local position on 1st January, 1920, the approximate number of poultry in the State was 7,835,000, though the seasonal sales of table poultry had, of course, reduced the number to 3,168,000 in June of that year. This was a reduction of 500,000 head on the number carried at the corresponding period of 1919, or, in other words, a loss of 17 per cent The figures for 31st December last were not yet available, but the indications were that there were then approximately 7,500,000 birds on our farms, so that the position then was even better than was generally anticipated. The loss of 17 per cent. was serious enough, but, all things considered, it was satisfactory in view of the difficult period through which the industry had passed. Fortunately the high cost of feed had been more than counter-balanced by the rise in price of eggs, and this was borne out by the fact that notwithstanding the reduced number of producing hens, there was an increase of £313,000 in the value of poultry products for the year ended 30th June last.

Much had been said about the high price of eggs during the autumn and early winter months, and undoubtedly when eggs cost above 3s. per dozen, instead of being within reach of all classes of consumers as an every-day article of nourishing food, they became a luxury available only to a limited number in the community. The remedy seemed to be to cheapen production, and this appeared to depend on (1) cheaper food, (2) an increase in the existing flocks, or the building up of new ones, and (3) improving the quality of the stock. He had given directions that the resources of the Department were to be directed towards these objectives, and that all possible assistance was to be given the poultry-farmer in these directions.

The dominant factor in the food question was, of course, the prevailing high price of the staple foods. As a member of the Central Wheat Board, it was a delicate task for him to discuss the price of wheat and its by-products at a gathering of poultry-farmers, but they could rest assured that when the price of wheat was being fixed every effort was made to supply it to poultry farmers at as low a figure as possible. Many interests had to be considered, and those of the poultry-farmers were certainly not lost sight of. In addition, the Government, through the Meat Industry Board, had lately decided on the manufacture of lucerne meal, which was to be undertaken on an extensive scale, and would be supplied at a price carrying only the barest margin of profit. The results could not fail to be of the greatest benefit to the industry. In addition, he had caused a Foods Investigation Committee to be formed in the Department of Agriculture with a view to utilising any product that was likely to be of use as a poultry food. This committee had done valuable work, and was carrying out an important series of feeding experiments. One experiment would cover the feeding of different percentages of lucerne and other meals in addition to bran and pollard. Another test would embrace the feeding of cereals in conjunction with liver grains. It should be clearly understood, however, that the object of these experiments was not to displace bran and pollard from the daily ration, as for many reasons that was an impossibility, but to collect information about all the useful and cheap supplementary foods.

Contributed Papers.

Mr. G. W. Lavender read a paper in which he pointed to the deterioration of certain old breeds, and advocated the resuscitation of several that were being neglected.

Mr. W. H. Paine, Manager of the Animal Foods Department of the Metropolitan Meat Industry Board, reviewed the food supply of the industry, particularly in regard to bran and pollard, and dealt with certain substitutes that would possibly become useful, laying special emphasis on lucerne meal.

Some Observations on the Industry.

In the course of some observations on the poultry industry, the Poultry Expert remarked that the position in 1920 was interesting from the fact that according to figures, the poultry-farmer should have been in a much more prosperous condition in that year than in any previous one during the currency of the competitions. This had been attested by some poultry-farmers in a general way, but unfortunately it was difficult to get reliable data as a basis from which to estimate the probable returns from a well-run commercial poultry-farm. In using competition figures he wished to make it clear that these were not presented as possible commercial results. Rather it should be understood that, however they might lament the fact that many of the birds penned were not up to competition standard, they were nevertheless of a higher general average as layers than the birds on any commercial farm, because ninety competitors had all done their best to put in the best of their available stock at the time of penning.

If they compared the cost of feeding with the returns they would find that the cost per hen, in 1919, was 9s. 3d., while the gross return per hen was £1 8s. 4½d. In 1920 the cost of feeding rose to 12s. 8d., while the production amounted to £1 17s. 11d.—a difference of 6s. 2½d. per hen in favour of 1920, and yet there had been a decline of 17 per cent. in the number of birds kept.

At the 1919 Conference he had presented an estimate of the returns over cost of feeding on a 12-dozen basis. The return then was 9s 8d. per hen. He had further pointed out that the figures over the whole of the sixteen years showed that the high cost of food had been consistently followed by a higher price for poultry-farmers' products. On the same basis—12-dozen birds—and with the average price of eggs 1s. 10d., the return over cost of food in 1919-20 was 12s. 9d. The cost of feeding for the competition year ending 31st March, 1920-21, had risen to 12s. 8d. per hen, while the return over cost of food on the same 12-dozen basis, with an average price of eggs 2s. 2d. per dozen, worked out at 18s. per hen. It should be remembered that the falling off in numbers had been due, not so much to the operations of 1920 as to the conditions that had prevailed in the previous year. Therefore, the crushing out process was not so much due to the effects of the troubles of 1920 as those of 1919, and probably less to the prices of foodstuffs than to the difficulties attendant upon obtaining them. The changing from one food to another had also, no doubt, the effect of lowering production

The outcome of all this was that, notwithstanding increased value, there had been a decrease in the volume of production, and the higher value received for poultry products in 1920 was due principally to that circumstance.

In connection with the proposed feeding experiments, there appeared to be a notion abroad that the poultry-farmer must get away from the use of pollard and bran, and find substitutes for those articles. It might be as well to disabuse their minds of all such notions. He did not expect, nor did investigations support any such departure. If, for instance, they could imagine a food situation that would admit of the cutting out of mill offals, the effect would at once be the creation of another situation that would force upon them the use of them again, because they would become cheaper than other articles. So far as could be seen, the most they could hope to accomplish with cheap foods was to supplement the pollard and bran ration for the morning mash And this had been forced upon them by the fact that the industry had apparently outgrown its food supply. Substitute articles of food would avail nothing if they were higher in price. They must keep down the cost of production, and that did not appear possible if they used foods at a higher price than those ordinarily used, such as wheat, bran, pollard, and maize. They had before them many years' results of feeding on the foods mentioned, and had also definite figures in the annual returns of the competitions. It was no part of the Department's policy to experiment with foods more expensive than bran and pollard.

The Raw Material of Nicotine Solutions.

In consequence of an inquiry from an orchardist in the Bathurst district, early in the present year, the Department of Agriculture addressed the United States Department of Agriculture at Washington, asking whether ordinary tobacco is used for the manufacture of "black leaf 40," or whether a special tobacco is grown for the purpose.

The reply of the Insecticide and Fungicide Board, Washington, was to the effect that it was understood that all nicotine solutions made in the United States were manufactured from tobacco stems and tobacco refuse, or from waste tobacco not suitable for the manufacture of cigars, chewing or smoking tobacco. According to the Board's information, no tobacco was grown in the States essentially for the production of nicotine.

The Scientific Name of Kikuyu Grass.

In the *Journal of Department of Agriculture*, Union of South Africa, March, 1921, page 211, appears the following:—

We received last mail an answer to a letter addressed to Mr. Stapf on the subject of Kikuyu grass, which appeared to have been wrongly named at Kew. I wrote suggesting that the grass was *Pennisetum inclusum* Pilger. Mr. Stapf replied that after examination of the material of Kikuyu and of related species, he had established the fact that Kikuyu grass was not *Pennisetum longistylum* as he had previously supposed, but was *Pennisetum inclusum* Pilger; however, as the grass had previously been described under the name of *Pennisetum clandestinum*, Kikuyu grass must henceforth be known scientifically under that very appropriate name.

—E. Breakwell, Agrostologist.

Orchard Notes.

JULY.

W. J. ALLEN and W. LE GAY BRERETON.

PRUNING will still be one of the main operations to occupy the attention of growers of deciduous fruit. Where this work is completed on the stone fruits, attention can be turned to the pear and apple trees. Usually by the end of June most of these trees have lost their leaves, but owing to the unseasonably mild weather this season they have been very slow in dropping them and the work of pruning will be slower, as it is difficult to observe quickly in detail the condition of the tree.

Some general notes were given last month on pruning, but those not too conversant with this work should procure the Department's book on the subject. It is a good plan to take a few trees of each of your main varieties and prune them in detail with some variation, then watch the results during the next season. In this way you will find that the trees are the best teachers as to the way to handle them under the particular conditions under which they are growing.

Attention may be directed to the article on the pruning of the Rome Beauty apple in the June number of the *Agricultural Gazette*. Any scions that are required for the coming grafting season should be secured while pruning is going on, and buried in moist sand in a cool, shady spot. Care should be taken to obtain scions only from trees that have proved heavy croppers of a good type of fruit

Spraying.

With the exception of the very early blossomers, such as Edward VII, Bell's November, &c., an effort should be made to spray all peach and nectarine trees with freshly-made lime sulphur at full winter strength, or with Bordeaux mixture at winter strength, to control an outbreak of leaf curl.

Lime-sulphur is preferable to Bordeaux mixture under most circumstances, as it also helps to check San Jose scale, but winter strength lime-sulphur, applied later when the buds are just ready to burst, gives a better result over San Jose scale than an application while the trees are dormant, and where this scale is present a second application should be made at the later period. Apples, pears, plums, cherries, and apricots do not require an early application for leaf curl, and it is better, therefore, to delay the application of winter strength lime-sulphur for scale insects until the buds are just about to burst. As a matter of fact, in many tests the Department has applied winter strength lime-sulphur to deciduous fruit trees when the blossom buds are showing colour without any injury to the tree or to the setting of fruit. The effect is to give more opportunity for the scale to be also on the move, when it is less resistant to the spray, but owing to the erratic behaviour of sprays, though

one might feel justified in risking the application at this period himself, it is hardly safe to recommend it generally. Moreover, when one has to cover a large area, which taxes his spray outfit to its limit, and there is also danger of delays through bad weather, &c., it is a safer plan to start when the buds are well swollen, thus giving a longer period to get the work through. In all cases it pays to be thorough with the work, bringing the spray nozzles well out beyond the tips of laterals and leaders. These are the parts which are most easily missed, and to which the spray adheres less readily than the thicker wood of the tree.

Where San Jose scale is bad in an orchard or on any particular trees, miscible oil often gives a more thorough kill than lime-sulphur. The oil sprays are also useful on apple trees where woolly aphis is present.

Where mussel scale has to be contended with, the miscible oil should be used stronger than for San Jose.

Ploughing.

Last month the necessity was pointed out of getting the winter ploughing done by July, except where an autumn ploughing had been carried out and the ground had not again become set or had made a lot of weed growth.

In most districts there have been repeated falls of rain which have not only soaked the soil and subsoil, but have also caused much delay in winter operations. Under these conditions orchardists would be glad to see the ground dry up sufficiently to get on with their work, and one often feels that the land will never dry out again too much before the summer. Yet we would again impress upon the grower to push on with his ploughing as soon as the land is fit. There is no saying whether the spring may turn out dry, and after abnormal falls of rain the land becomes very compacted and seems to dry out surprisingly quickly.

Where farmyard manure or slow-acting fertilisers are being used they should be spread and turned under at this ploughing.

Planting.

Except for those deciduous trees that start early, planting can be continued this month provided the land is in good condition.

WORK ON THE MURRUMBIDGEE IRRIGATION AREAS.

Lime-sulphur applications at winter strength should be made on all varieties of peaches as early as possible as a safeguard against peach curl. Hitherto Pullar's Cling has not shown the effects of the disease to any extent, but last season quite a number of trees bore evidences of it.

It will be well also to spray apricots with lime-sulphur for shot-hole; many blocks were affected with this last season.

Red mite was also bad last season: when lime-sulphur was used it did not have the desired effect on some blocks of prunes, and no doubt miscible oils would give better results.

Where it is not necessary to use miscible oils, it is wise to treat all deciduous trees with lime-sulphur at full strength during the winter.

The swabbing of vines should also receive attention: growers should use the 10 per cent. solution of sulphuric acid.

Pruning.

The pruning of peaches, apricots, plums, and prunes should be pushed on with, and vines, pears, and apples should follow. In pruning the Pullar's Cling peach it would be well to consider its habit. It is sometimes necessary to leave two-year-old laterals which are carrying yearling laterals or spurs, where there are not sufficient of the previous year's primary laterals.

Winter Ploughing.

Winter ploughing should be well in hand now, and the work should be done so that the open furrow will be left in the centre of the rows and act as a drain to carry the winter rains off the land. Winter ploughing should be from 7 to 9 inches deep where possible, the soil and main roots of the tree being considered. Many orchards on the area are ploughed shallow at all times, and the work should generally be deeper.

Planting.

The planting of all deciduous trees and vines should be started this month. See that all damaged roots are cut back to sound wood, and that before growth starts all top growth is headed back hard. Grape vines should be cut back to two eyes when planted. The planting of citrus trees should be postponed till later—preferably until August or the early part of September.

It was noted on some blocks last season, that where Robe de Sergeant and Prune d'Agen were planted side by side, the "Robe" trees nearest the "d'Agens" cropped best. It might be well to consider the arrangement of the trees in the orchard from the point of view of cross-fertilisation. Prune d'Agen is evidently suitable for the purpose in connection with "Robe."

Harvesting.

Early harvesting of Thompson's Improved Navel and Navelencia is wise, owing to their tendency to dry out. In harvesting the citrus crop it might be well to place consignments regularly on the market as soon as they are well coloured, rather than to wait until late in the season and then to place heavy shipments for disposal at a time when coastal supplies are likely to cause a glut.

Apiarists should possess a good knowledge of the honey-producing flora in their respective districts, as very often a flow of inferior honey will follow close on a flow of good honey, and unless the flows are kept separate serious loss may result. A small percentage of dark honey often spoils a crop of superior grade honey. Some prominent western beekeepers have had this experience this season.—H. Graham Smith, Instructor in Apiculture, Hawkesbury Agricultural College.

Agricultural Bureau of New South Wales.

DISTRICT CONFERENCE AT INVERELL.

A District Conference of the Agricultural Bureau, the second in this State, was held at Inverell on 30th April. The Conference was convened at the suggestion of the Tingha branch, and a number of important and interesting rural questions were discussed. Mr. J. Ditzell (Chairman, Inverell branch) occupied the chair, and other delegates present were Messrs. G. W. Browning, William Vickery, A. M. C. Levett, John Hawkins, and Rev. J. T. Redhead (Tingha branch); J. W. Dawson and T. J. Gray (Elsmore branch); and F. A. Lewin, W. A. Kook, C. Lenthal, A. S. Pigott, R. L. Campbell, A. Fowler and J. Leech (Inverell). Mr. C. C. Crane, Organising Inspector, was also present, and Mr. J. T. Dale (Secretary, Inverell Chamber of Commerce) attended for a portion of the time.

Among the resolutions passed were the following:—

That the most effective method of reducing the cost of living is the encouragement of co-operation, and that the Department be asked to assist the movement by furnishing branches with information *re* successful systems in Denmark, England, U.S.A., &c.

That the proposed pruning competition is worthy of the support of the district branches, and that the Department be asked to place such competitions on a proper footing by issuing certificates of competency to the successful competitors

That the Department be asked to assist branches in interesting children in rural life by the formation of clubs on similar lines to the cotton, corn, and canning clubs in U.S.A.

That encouragement be given local industries by: (*a*) Experimenting in the culture of various plants, such as linseed, cotton, sugar beet, tobacco, or any other known plant likely to start local industries; (*b*) approaching the Government with a view to having the preferential rate system altered, so that it will assist, instead of retard, local industries; (*c*) making inquiries, both here and abroad, either through the Government or direct, regarding all such industries.

That as Inverell is the most important centre in the north, the Government be approached with a view of having an experimental farm established handy to the town.

That as the import duty now imposed on all classes of agricultural machinery threatens to paralyse the whole of the primary industries, the Federal Government be asked to revoke same in order to stimulate rather than to retard production.

That in order to assist the P. and A. Society, the conference devise a scheme of putting in an exhibit of farm produce in trophy form in the 1922 Show.

That in order to stimulate land settlement, and remove stagnation, the Government be asked to adopt a more vigorous policy regarding railway construction in country districts, and that our members be asked to bring the matter of connection by rail with the northern system immediately before the Government.

That as the present high freights on manures, seeds, and machinery threaten to materially lessen production, the Government be asked to reduce same by at least 50 per cent. up to 300 miles, and 75 per cent. over 300, in order to increase settlement and assist in decentralisation.

REPORTS AND NOTICES FROM BRANCHES.

NOTE.—While gladly publishing in these columns the views of members of the various Branches of the Agricultural Bureau, the Department does not necessarily endorse the opinions expressed.

Adamstown.

The ladies' branch at this centre met on 26th April, when an interesting discussion took place on the pruning of roses and the culture of Cape gooseberries, Messrs. Brock and Lewis (of the gentlemen's branch) attending and affording interesting information.

Auburn.

The first annual meeting was held on 14th May, when the business was transacted amid a social atmosphere created by a pleasingly arranged room, a programme of song, music and story, a collection of fine specimens of flowers and vegetables, and light refreshments.

The report showed a year's useful work, and the balance-sheet a credit of £5 19s. The election of officers resulted thus:—Chairman, Mr. F. J. Burrows; Vice-chairmen, Messrs. W. H. Petch and J. Bailey; Treasurer, Miss Dole; Hon. Secretary, Mr. J. J. Pratt; Assistant Secretary, Mr. A. Baxter; Auditors, Messrs. Murdoch and Jones; Steward, Mr. Metcalfe; Monthly Exhibition Judge, Mr. G. Somerville.

A trophy (a fountain-pen) was presented to Mr. A. Curr, who introduced most new members to the branch during the year.

The prizes won by the competitors in the monthly exhibitions were presented by the Chairman. The aggregate prize was won by Mr. Westcott.

The branch met again on 11th June, when Mr. C. Bennett, of Wentworthville, delivered a lecture on the electric culture of plants. Photographs of the results obtained by Mr. Bennett in his own garden were exhibited and greatly impressed all present. The lecture was regarded as one of the most interesting yet given in connection with the branch.

Bimbaya.

This branch met on 24th May, when preliminary arrangements were made *re* crops to be grown for an exhibit at the next Candelo show.

It was agreed to inaugurate a maize-growing competition, open to boys and girls under eighteen years of age, but confined to the children of members of the Bureau. Prizes will also be given for the best collection of jams, jellies, and preserves made by girls under eighteen years.

The branch is taking an interest in the establishment of a branch of the Rural Bank at Bega.

Blacktown.

This branch staged a district exhibit at the Hawkesbury show on 12th May, and scored 472 points, which won it second prize. Heavy rain prevented a considerable quantity of produce being forwarded, but the exhibit was nevertheless a very creditable one. Quite a number of members assisted in the organisation and the staging of the exhibit.

At a meeting on 28th May, the chairman and secretary reported having attended a conference at Parramatta with regard to the establishment of municipal markets in that town. The secretary, Mr. Lalor, also reported attending a conference of delegates of various branches of the Bureau at Wentworthville, when a co-operation of branches was formed under the title "Cumberland Agricultural Bureau United," to assist branches in holding exhibitions, &c. Arrangements were made for the continuance of the delegates in their work.

A citron melon, weighing 84 lb., was forwarded by the secretary of the Lower Portland Branch, and accepted with thanks. An excellent sample of peanuts was exhibited by Mr. Clifton, and this promoted some discussion on peanut culture. Mr. W. McCullough stated that he grew 140 peanuts on one plant at Prospect. Mr. Lalor remarked that he cut forty canes, each 0 feet long, from a single root of elephant grass at Seven Hills; and Mr. Clifton reported a sweet potato (white), weighing 13½ lb.

The treasurer reported that the credit balance at date was £12 12s.

Castle Hill.

At a meeting on 18th May an instructive address on vegetable-growing generally was given by Mr. H. Rumsey, to an appreciative meeting. The importance of good drainage and cultivation was emphasised, and the fact that good results could not be obtained without both was clearly indicated. To observance of these two things Mr. Rumsey attributed his own success, for he began vegetable-growing without any previous experience.

Clifton (near Young).

This branch held a meeting on 3rd May, when, in addition to general business, a lecture was given by Mr. Wyndham on bees.

The lecturer began with a very interesting description of the bee's anatomy, and then went on to say that the best site for an apiary was an eastern slope, well protected from winds, and as near to a forest or to many trees as possible; above all, it should be above flood-level. The beginner should start with only two or three hives, and should read up the subject of bee-keeping as well, increasing the number of his hives as he gained experience. The laws regarding frame hives must be observed, and in any case they are a great advantage. They did away with all difficulty in examining the hive for signs of disease, and also enabled the honey to be extracted more easily and without waste of comb. The various kinds of bees in the hive, and the internal economy of a colony were described; and finally diseases were briefly dealt with.

Cooper's Shoot–Broken Head.

A meeting was held on 21st May, when a discussion took place on the rice bean and its utility as a green manuring crop on banana plantations, and several members decided to give it a trial in the coming spring.

Gerringong.

The monthly meeting was held on 24th May, when a paper on maize-growing was read by Mr. C. T. Hindmarsh. The following paragraphs are extracted from the paper:—

MAIZE-GROWING.

Maize needs a rich soil, and does exceedingly well on the flat land of this locality; yet on the hills very profitable crops can be obtained if the season is suitable. The ground should be ploughed up in the winter, broken down fairly well, and left in this condition until rain falls; then, when the ground is dry enough, it should be disced to conserve the moisture. If the ground is reploughed just before planting, harrowed and rolled, it ought to be in good condition for planting.

The time for planting varies from September to December according to the season. If the early varieties, such as U.S.133 and Silver King, are sown, say, at the end of September, two crops can be gathered in the season, as they mature in eighty to ninety days.

Planting is done most expeditiously by a machine with a five-hole thick plate and a 13 sprocket. This gives four or five grains in a hole, and about 3½ feet apart in the drills. A ten-hole thin plate can be used with a six sprocket; this gives a grain every 10 inches. I prefer planting drills 3 feet 6 inches apart, as the crop can then be conveniently worked with the ordinary scuffler. I have found using two horses and sighting pegs to be the most satisfactory way of using the machine. With one horse, the driver cannot see ahead, and to see the marker he must pull the machine to one side.

If a machine is not available, the next best method is to drill with a furrow plough 3 or 4 inches deep, and drop the seed by hand three or four seeds every 3 feet, or separate seeds every foot, and then harrow in. With this method I have found that it is not advisable to leave the farrows open too long, as the moisture lost by so doing will make a big difference in the way the seed will germinate.

The advantages of the machine are that the seed and manure are both put down at the right depth and then covered in at the same operation.

I have found that 2 cwt. per acre of superphosphate gives very satisfactory results, though these can be improved on by the addition of bone-dust.

When the plants are 12 to 18 inches high in normal soil, the roots will have extended 1 to 2 feet from the plants in a lateral direction, and as the plant grows they gradually approach to within 3 or 4 inches from the surface. This goes to prove the necessity for shallow cultivation, as stirring the soil too deeply will be detrimental to the yield. The shallow-rooting habit of maize also calls for great care in hilling with the plough, where that is considered necessary.

Hilling maize is a practice that I do not recommend, as from my own experience there is nothing gained by it, and the ridges left make the following ploughing very awkward.

The first stage of growth, three to four weeks, sees the whole of the plant constructed in embryonic form; all the nodes, leaves, and rudimentary ears are present at the end of this period. Even the number of rudimentary grains on the ear are all present and cannot be increased thereafter, and the next stage of two or three months is confined to the elongation and increase in size of the parts already formed. During the third stage, the internal elaboration of the plant-food already taken up takes place, and the starch is transferred from the leaves to the ear—that is, the grain is developed. This explains the need of a well prepared seed-bed, and the conservation of moisture.

The selection of seed maize is best carried out in the field by taking the cobs on the best producing stalks, such as those which produce two well filled cobs. Cobs should be selected that are well protected by the husk at the top.

After selecting in the field, I also go over the cobs again in the barn for uniformity, to see that they are well filled on the butt and tip of the cob, and that the rows are not too widely spaced, and that the number of rows on the cob is correct.

Experiments have proved that the operation of suckering maize does not warrant the expense, and I would only advise suckering when there was a shortage of green fodder for stock, as in times of a dry spell, when one did not want to sacrifice the crop of maize.

Experiments carried out in 1903 at Hawkesbury Agricultural College also proved that de-tasselling, or taking off the upper portion of the stalk after the cob had set, resulted in a loss of 5 bushel per acre in the yield.

Carbon bisulphide is one of the most effective fumigants for maize intended for seed. If the fumigation is to be successful the seed must be treated in an air-tight receptacle and fumigated for twenty-four hours. After that time the seed must be spread out in the air to get rid of the fumes, which, if allowed to remain in contact with the seed for any length of time will injure its germinating power.

At ordinary temperatures 1 oz., or two large tablespoonfuls, is sufficient for 3 bushels of shelled grain. Carbon bisulphide is heavier than air, and the liquid should be placed in shallow vessels or poured on to cotton waste on top of the seed to be treated. This fumigation does not affect the grain as food for stock.

In the variety trial, which I have just completed (with the exception of ascertaining the weights per acre) in connection with the Department of Agriculture, thirteen varieties were sown on 14th October, 1920. At the time of sowing, the ground was in good condition, having been worked since the winter crop of sorghum had been taken off, but it was a little on the dry side for a good germination. Fortunately two thunderstorms resulted in 84 points of rain, which caused a very good germination. All varieties were well up by the 27th October, and only a few grains of one variety had to be re-sown, and these may have been missed by the drill.

U.S. 133 and Silver King tasselled early in December, Funk's Yellow Dent the fourth week in December, and the other varieties were not far behind. At this period 97 points of rain fell, helping considerably the fertilisation of the grain. U.S. 133 and Silver King were ready for harvesting at the end of February.

The interest of the lecture was enhanced by the exhibition of cobs of all the varieties grown in the trial.

Glenfield.

A useful paper was read by Mr. W. Magee on wool and wool-classing at a meeting on 17th May.

Glenorie.

At a meeting on 28th May a discussion took place on pruning, and arrangements were made for an early pruning demonstration.

Kellyville.

A well-attended meeting was held on 9th May, when ordinary business was transacted.

Kunama.

A branch of the Bureau has been formed at this centre, the first secretary being Mr. T. G. Braithwaite. A meeting was held on 19th May, when general business was transacted, and a lecture was given by Mr. Siefleet.

March.

The members met on 18th May, when a paper on co-operation was read, and provoked some discussion.

A packing demonstration was given by Mr. H. Broadfoot, Fruit Inspector, at Mr. H. V. Howarth's orchard on 8th June, and was found most instructive by those who attended.

Matcham.

A meeting took place on 21st May, when arrangements were discussed for the Matcham Village Exhibit at the next Gosford show.

Middle Dural.

This branch met on 19th May, when several matters connected with its general usefulness were discussed, and delegates to the Fruit-growers' Association's Conference were appointed.

Milton.

This branch has been considering the purchase of one or more bulls of good breeding, with a view to their use by members for approved cows. Two meetings were held during May on the subject, but unfortunately both were wet nights, and the matter had to await a meeting on 14th June, when it was decided to purchase two bulls (one each Shorthorn and Jersey.)

Mittagong.

Mr. Hill, Fruit Inspector, was present on 16th April at the Farm Homes for the purpose of giving a pruning demonstration, but as the ground was wet and it was raining heavily, the intention could not be proceeded with. However, Mr. Hill made good use of the time by giving a lecture, which was much appreciated by hearers. The varieties to grow, the methods of pruning, and the methods of packing were all usefully touched on. The lecture was held in the packing-house at No. 8 Farm Home, so that material was at hand for practical demonstration.

Moss Vale.

On 16th May Mr. A. E. Hamilton, Inspector of Stock, lectured before this branch on matters of general interest to stockowners.

The important part that the minute organisms commonly called germs play in everyday life was explained, and the various diseases that they cause were mentioned; many interesting lantern illustrations of the various germs were projected on to the screen. Anthrax, tuberculosis, swine fever, and strangles were specially dealt with; and the ways in which they and other diseases might be combated and treated, and also prevented, were pointed out. A series of slides illustrating ringbone, spavin, splints, &c., was also shown, notably one showing the growth of bone over the rope of a halter left on a horse when he was turned out.

Mount George.

A branch has been formed at this centre that has every prospect of a useful existence. The following are the office-bearers:—Chairman, Mr. H. J. Bakewell; Vice-chairmen, Messrs. J. H. Cameron and R. D. Andrews; Treasurer, Mr. T. H. Hodgins; Hon. Secretary, Mr. A. W. Andrews.

On 21st April, Mr. Max Henry, M.R.C.V.S., visited this district and delivered a lecture on mammitis, which was greatly appreciated by all hearers. The symptoms and causes of the condition were clearly described, and the means that might be adopted to avoid it were indicated in a useful way. He urged all dairymen to fatten affected cows (except tubercular ones), and dispose of them to the butcher, as the disease did not extend beyond the udder. The question was asked whether the milk from an affected cow was fit for consumption provided it was boiled, and the answer was in the affirmative. Whether a cow that lost one-quarter would give her full normal yield was also asked, but the answer was a negative.

Mr. A. A. Ramsay, Principal Assistant Chemist, delivered a lecture before the members on 19th May, his subject being manures and their use on the farm.

Oberon.

On 19th May members of this branch met and made arrangements for a display during "Country Week" in Sydney of potatoes grown in the district, and also for a trophy of products on the occasion of the turning of the first sod of the Tarana-Oberon Railway.

A potato competition was held, five exhibitors producing twelve potatoes, each of the Early Rose variety. Mr. D. Eaton acted as judge, and awarded first place to Mr. G. N. Falls and second to Mr. W. Franklin.

A paper was read by Mr. A. Buckley on fruit-growing, especially the control of black spot.

A Grower's Experience with Pests and Diseases.

Mr. Buckley said he had started some years ago to make a living by fruit-growing on a small piece of light sandy land. After a while he realised that disease was rampant in his orchard, and that something would have to be done. He had conducted various experiments with different formulæ for control of insects and fungi, and had made various discoveries of his own. San José scale he soon found could be controlled with lime-sulphur in the spring. Woolly aphis required a high pressure spray, and though his trees were supposed to be on Northern Spy stock, he doubted if they were. Codlin moth could easily be controlled with the three sprayings with arsenate of lead as recommended by the Department. For leaf-curl he used lime-sulphur or Bordeaux mixture. With black spot he had more trouble, and had had variable results with different sprays, but had latterly been better satisfied with lime-sulphur. The prevalence of this disease depended on the weather, but spraying prevented it from spreading and the spots also died out. On one occasion he had had a good crop set on Fanny and Cleopatra, but owing to black spot had only harvested half a crop. The next year he used lime-sulphur, and from forty-six trees had sold 300 bushels.

His method of cultivation was to plough once in the winter and again late in the spring. He preferred low-headed trees, as though more work was involved in their cultivation there was less trouble in picking, while the sunlight got into the trees better. There seemed always to be more black spot on the south side of the tree. Early pruning caused more growth than late pruning, according to his experience.

On 4th June members met again and discussed a proposal to send a delegate to the North Coast to arrange for the sale of seed potatoes direct to the growers there. It was agreed eventually to communicate with other branches of the Bureau, through the Organising Officer, Mr. C. C. Crane, inquiring the possibility of direct transactions with North Coast growers.

Pambula.

A meeting took place on 6th May, when the success that seemed to be attending co-operative buying in other centres was discussed, and it was agreed to obtain particulars of the methods adopted there.

Preliminary arrangements were made for staging a district exhibit at the next local show, and an effort is to be made to ensure a thoroughly representative collection, including the local timbers for which the district is well known.

The importation of parcels of seeds containing weeds and foreign matter was the subject of condemnation, and it was considered that greater supervision and control should be exercised in the matter.

Penrose-Kareela.

The monthly meeting was held on 16th May, when the balance-sheet for the exhibit at the Royal Agricultural Show, Sydney, was presented, showing a credit of £3 8s. 7d. A considerable part of the evening was spent discussing the possibilities of a co-operative movement in connection with the branch.

Springside.

At a meeting on 24th May, Mr. W. R. Birks, Inspector of Agriculture, delivered a lecture, a summary of which will appear next month.

Sydney (Metropolitan).

An illustrated lecture on the Murrumbidgee Irrigation Areas was given by Mr. D. J. Quinn, at a meeting of this branch on 23rd May. Glowing pictures of the progress and possibilities of the great scheme were painted, a feature being a comprehensive display of exhibits representing every form of produce grown on the area. A fine series of slides illustrating the development of the work from its inception to the present stage, with 1,300 homesteads, incorporating 70,000 acres, was also screened.

Lecturettes were also given by Mr. A. H. E. McDonald, Chief Inspector of Agriculture, Professor Watt and Professor Douglas Stewart, of Sydney University.

The attendance was large, and there was evidence of a quickening interest in agricultural matters. Mr. A. A. Hamilton has been elected Hon. Secretary of the branch.

Tahmoor.

A meeting of the branch was held on 14th May, when Mr. A. Crane read a paper on the marketing of fruit, and provoked a useful discussion.

Tennyson–Kurrajong.

A meeting was held on 2nd May, when Mr. H. C. Pain lectured on common diseases of stock, and interested his hearers.

Thyra–Bunaloo.

The best depth to sow wheat in dry and moist soils respectively was the subject of discussion on 21st May.

Mr. W. Glenn favoured sowing as shallow as possible, provided the grain was covered; in any case, no deeper than 1 inch. Wheat had a great capacity for sprouting again, providing mould did not make its appearance, shooting at least three times and growing.

Mr. Berryman said that with pickled and manured wheat the risk of mould was greater than with unpickled wheat when sowing in a doubtful seed-bed.

Mr. TOMLINSON found that after rain the greatest danger from mould was when several frosts had set the ground just as the grain was shooting, thus excluding the air. If the surface was at all set, especially in frosty weather, it was always a payable proposition to break the surface with the harrows.

Tingha.

At the April meeting a paper was read by Mr. D. McNab, portions of which are extracted as follows:—

SURVEYING AS APPLICABLE TO THE MAN ON THE LAND.

The landholder frequently requires to know the areas of certain portions of ground to a fairly accurate degree, but without having to employ a surveyor, as, for instance, the area of a part of a paddock that has been ringbarked, or scrubbed, or the area of a ploughed paddock. He may require the actual cubic contents of an excavated tank or dam, or he may want to cut a water-race to fill the dam at a certain grade. By the correct use of the "surveyor's chain," as it is usually called, together with a plumb-bob, most of these can be obtained accurately.

The first essential point to be remembered is that all measurements must be reduced to the horizontal, and consequently all areas are measured as if they were all on the one level plane. The old surveyors' chain consisted of 100-link pieces with swivel joints, and about 400 wiring parts, which meant that after a while a chain of this type became inaccurate. The more modern type is a plain steel band with one or two swivel joints, marked off into links with brass studs, of which every tenth link has a distinctive mark and with a width of about half an inch. In addition a steel-band chain varying in width from one-sixteenth to one-eighth inch and from 5 chains to 3 chains long is used, with the end of it for about 50 links marked in 10 links, and the end 10 links at every link, and also marked at every chain. These chains are light, strong, and accurate, and are made without any projecting parts to catch when being pulled through the scrub. For a plumb-bob, a suitable weight, such as a three-quarter inch nut, attached to a fine string suits admirably.

To chain a line two men are required, who must keep in a straight line. It is best then to line off the lines with pickets before chaining. The pickets can be set in line by sighting with the plumb-bob, selecting straight sticks and sharpening them at each end, and setting them in the ground as far apart as they can be conveniently seen. A small piece of paper fixed to the top of a picket enables it to be distinguished from surrounding scrub.

Work is facilitated by marking off the whole of the lines to be chained, as the number of marked lines is then known. This leads us to the question of how many lines are required to enable the area to be found. In many cases four lines are sufficient in marking off the perimeter or outside, but these four lines are not enough to determine the area unless the four-sided block be rectangular in shape. An additional line must be measured between a pair of opposite angles if the four-sided figure is not a rectangle. For every additional outside line required to mark off the area an additional diagonal must be measured. Thus a four-sided figure is measured by the sum of areas of two triangles thus formed, a five-sided figure by three triangles, and, in general, the number of triangles in the subdivision is two less than that of the outside lines. In many cases, however, the area can be marked off in the form of a rectangle or four-sided figure with the angles 90 degrees or right angles, in which case the opposite sides are of equal length. The area is then got by multiplying the length by the breadth.

To mark off a right angle a very handy instrument is the optical square, but a right angle can be measured off by means of the chain alone. First measure off 30 links on the fixed side and put in a peg. Then measure off 40 links, and mark off a curve by sweeping round an arc at the end of the 40 links. Then from the second peg on the line lay off 50 links in a curve to cut the other marked curve, and the point of intersection will give a point in the line at right angles to the first line. This has then to be carefully lined out and carried on.

To measure a block nearly a rectangle, a system of give-and-take can be used with fair accuracy. Take a four-sided figure, with a hill in the middle. How can you run a line between the two opposite corner-posts? Take a case when the opposite corners can be seen from the top of the hill. It would seem to be an easy matter to put a peg on top of the hill in line, but how? It can be done as follows:—First take a straight stick, 5 or 6 feet long; sight to one corner, looking from the middle of the stick. Hold the stick steady, and sight it to the other. If you are standing near the middle of the paddock and you find your line is out (say, 20 panels of fencing), you know you have to go about half that

distance to get the approximate line. Then the best method is for each man using a picket to sight one to the back corner, the other ahead, each putting the other alternately on line, until they both come into line. Where several hills or objects intervene it is more difficult to run a line between the two points, but by noting natural features, such as a tall tree near the corner, a line can often be run fairly close.

Another method of finding areas is a graphical method by charting the measurements on a plan to a given scale, and in this connection there is a wonderful little instrument called the planimeter, which by mechanical means does all the calculation of area of a block, no matter how irregular.

The monthly meeting was held on 7th May, when the report of the conference of branches at Inverell on 30th April was received.

A trophy, consisting of a fine silver-plated epergne, donated by Mr. J. Symes in connection with the "what-a-woman-can-do" competition at the recent show, was presented to Mrs. Shaefer, the winner.

Discussion took place on the advisibility of forming a P. and A. Association to conduct the show, which it is felt interferes too much with the regular work of the branch, and it was decided to call a public meeting to consider the matter.

The branch asked for suggestions for the conduct of a garden competition for boys, and the following is the substance of the suggestions of the Department:—

A Suggested Garden Competition.

Of the crops mentioned, onions appear to be the most neglected in this State, and the bulk of the requirements are imported. Anything that would help in popularising this crop within the State, apart even from de-hydrating, should be encouraged whenever possible, and for this reason the Department would suggest the onion crop. Although now a little late for an early crop, it is not altogether too late for planting.

The following rules are suggested, and might be found of use. It will be seen that certain particulars have been left open for the decision of the committee:—

1.—The competition shall be open to boys under the age of.....

2.—Applications should reach the secretary not later than a certain date, giving (*a*) full name and address, (*b*) age last birthday, and date of birth.

3.—The area should be.....

4.—Any variety of seed may be used by the competitor, or seed might be supplied by the committee.

5.—Only one entry should be allowed each competitor.

6.—The time for sowing should be restricted to within a given time.

7.—Each competitor should be required to keep a record showing the dates and particulars of the different operations on the plot, and these records should be delivered to the superintending official when requested.

8.—No competitor shall be allowed to employ any labour on the competition plot other than his own personal labour.

9.—Competitors may be present during any judging.

10.—The decision of the judge, or judges, shall be final.

11.—The aggregate points shall be 100 in Section A., and they shall be allocated in the following way:—

Section A.

Yield	50	points.
Market value of produce	15	,,
Evenness of growth	5	,,
Freedom from disease	5	,,
Thoroughness of cultivation, and general neatness.	15	,,
Trueness to type	10	,,
	100	

If desired, points may be awarded for two other sections, such as :—

Section B.—Exhibit of a given amount of produce at a local exhibition—

Trueness to type	20	points.
Evenness of bulbs	20	,,
Freedom from disease and bruises ...	10	,,
Market value	50	,,
	100	

Section C.—Best record of operations on the garden plot.

Prizes might be awarded for each section, and a further prize to cover the aggregate of the three sections.

Toronto.

A meeting was held on 3rd May, when Mr. C. C. Crane, the Organising Inspector, delivered an address on the aims of the Agricultural Bureau, and was accorded a vote of thanks.

Uki.

A branch of the Bureau has been formed here, with Mr. J. H. McCollum as Chairman, and Mr. W. G. Longley as Hon. Secretary.

Wallsend.

A meeting was held on 18th April, when the greater part of the evening was devoted to the proposal to form a wholesale purchasing department, and arrangements are being made, in consequence, for securing the assistance of other branches to band together to secure one buyer for the district.

On 19th May a meeting was held, at which it was reported that during the month a party visited Hawkesbury Agricultural College. Mr. W. le G. Brereton had visited the district and had given a pruning demonstration of pruning in Mr. F. Bailey's orchard. It was agreed to make an effort to get another demonstration of the same kind.

It has been decided by this branch to purchase a pure-bred Jersey bull with which the herds of members could be graded up to a better standard.

Warrah Creek.

At a general meeting on 19th May trustees were appointed for the machine-gun allotted to the district, and it was agreed to ask for a trophy from the 35th battalion, the branch to discharge all expenses.

The branch has taken a prominent part in obtaining a telephone line for the district, and also in the erection of a co-operative sheep dip.

Efforts are being made to get a few roots of kikuyu grass for members to try for themselves.

Wentworthville.

The autumn show of this branch was held on 2nd April, the Hon. W. F. Dunn, Minister for Agriculture, attending to open the show. He congratulated the branch on its activities, remarking that such a district, in close proximity to the city, should be semi-agricultural in its interests, and should supply a large quantity of fruit and vegetables to the city markets.

The entries for the show numbered 250, and the exhibits were high-class throughout, and an excellent collection of non-competitive products (maize, paspalum, elephant grass, jams, etc.) was made.

The following officers were elected at a general meeting on 27th April :— Chairman, Mr. E. T. Baker; Vice-chairmen, Mrs. E. Friend and Mr. F. Andrews; Treasurer, Mr. E. S. Taylor; Hon. Secretary, Mr. H. Druce.

The report showed that twenty-seven meetings had been held during the year, with an average attendance of thirty-four. Many useful meetings, competitions and displays had taken place, and fifteen lectures had been delivered, while some co-operative buying had also been done. The balance-sheet showed a credit of £9 18s. 2d.

A conference was held under the auspices of this branch on 28th May to discuss the formation of a central body to run a combined district exhibition confined to branches of the Bureau. The branches represented were Quaker's Hill, Kellyville, Auburn, Blacktown, and Wentworthville. A council of the kind was formed, to be known as the "Cumberland United Agricultural Bureau."

Mr. F. Madden was elected Chairman and Mr. H. Druce, Hon. Secretary *pro tem.* A further meeting is to be held early in July, wlen it is hoped every branch in the county of Cumberland will be represented.

Yarramalong.

The members of this branch met on 27th April, when general business was transacted.

Yarrandale.

General business was transacted on 24th May, and a paper was read by Mr. J. Adams on grain sorghums.

The Grain Sorghums.

Treating these crops from the point of view of the wheat-grower, Mr. Adams said he considered the usual "hit or miss" style of growing wheat all wrong, and it was for this reason that he advocated the inclusion of a summer crop and a reduction of the area usually put under wheat. The proportion he favoured was two-thirds wheat and one-third summer crop. For the latter purpose, grain sorghums were well suited. The two varieties he recommended were Feterita and Milo. Both yielded up to 50 bushels of grain to the acre. They took the place of maize where the rainfall was usually insufficient to mature that crop. These grain sorghums recently introduced by the Department of Agriculture were hardy, and matured a crop under adverse circumstances, and in a good year such as the last they were most prolific. In order to reduce the risk of failure he advised at least a short fallow for the area to be put under grain sorghums, thus conserving the moisture and eradicating weeds, especially black oats.

The crop can be harvested for ensilage, hay, or grain; but it is as grain that it is most valuable. Having practically the same feeding value as maize, working horses, poultry, and pigs did well on it.

Until a good market was available for the grain, or provision was made for its consumption by farm stock, Mr. Adams did not recommend putting in large areas, but if he had a proportion of his land under a summer crop, the farmer had more time for the preparation of his wheat area, and the crop was harvested more expeditiously. Should the season prove unfavourable for the wheat crop, he still had the chance of making good on his summer crop. As regards the harvesting method for grain sorghums for small areas, perhaps hand-picking and flail-threshing was best; but large areas could be cut with the binder and put through a thresher, or the crop could be harvested with a header quite successfully.

Departmental Note.—The Chief Inspector of Agriculture remarks that the results indicate that the grain sorghums will be very useful to wheat farmers, particularly those who keep pigs as a side line. If those who keep one or two pigs for their own use be excepted, the number of wheat farmers who keep pigs is very small, for the reasons (in part) of the difficulty of marketing the animals and of securing reasonable prices. The Agricultural Bureau is an organisation that can materially improve conditions in this respect, by enabling farmers who have a few pigs to come together and to make plans that will enable one or more trucks to be consigned at one time. This would reduce the expense of marketing, and would also ensure the best possible prices. A move in this direction has been made by the Cunningar branch of the Bureau, and the results have been so satisfactory that there is now a marked increase in the number of pigs in that district.

Yurrunga and Avoca.

At a meeting on 23rd April it was agreed to obtain a supply of fish from the State fish shops, a few members having already got an order with satisfaction. Members requiring fish place their orders for a month (cash with order), and the chairman weighs out the fish every Friday morning. So far the scheme is working well, and has helped to swell the ranks of the Bureau.

On 27th April a party of members visited Mr. A. Hordern's "Milton Park" property for the purpose of inspecting the cattle. They were shown round by the manager, Mr. Carter, and greatly enjoyed and profited by the day.

Do Bees in Queenless Colonies Steal Eggs?

For several seasons I have noted, when examining queenless and broodless colonies of bees, that occasionally an embryo queen cell will be found to contain an egg. Many apiarists have noted similar cases. Do the bees, then, recognise their utterly hopeless condition at having no queen and no brood from which to raise a queen, and steal an egg from another colony for the purpose of raising a queen? Undoubtedly, the egg is obtained from somewhere, and there seems to be no way in which it can be obtained other than by stealing it from another colony.

One can imagine bees in a queenless condition setting out on such a mission—their battle with the guards at the entrance of the hive it is intended to rob, their reception by its hostile little inmates, and, finally, the difficulties they must surmount in the safe transference of the egg to an embryo queen cell in their own hive. Perhaps the attempt to steal an egg is comparatively common among queenless colonies, success only being rare.

On one occasion this season at the Government Apiary, at Wauchope, there was proof that, at least on some occasions, bees do transfer eggs to embryo queen cells. A few queen cell cups used for queen-raising were left above an excluder on a colony that was about to swarm. On examination after the fourth day, one of the cups was found to contain an egg—an egg, moreover, in a fertile condition, for it eventually produced a queen bee. In this case it seems probable that the egg was transferred from the lower storey where the queen was in occupation; both colour and breeding of the queen point to this.

The transference of eggs as just explained gives rise to another problem: Do bees, when making preparation to swarm, transfer the eggs to embryo cells? It is usually considered that the queen lays the eggs in the cells, but from our recent experience it seems likely that the queen has no say in the matter, and the transfer of the eggs to cells required is carried out by the workers.—W. A. Goodacre, Senior Apiary Inspector.

What Herd-testing Effected.

After six cow-testing associations in New Hampshire, U.S.A., had been at work for two years, nineteen herds showed an average increase in the yield of 763 lb. milk per cow, or an annual improvement in the return of nearly £10 over cost of feed. In six associations that had been at work for three years six herds showed an average increase of 866 lb. milk per cow, and an income over cost of feed of nearly £20 more than the herds formerly averaged. In seven of the associations 216 cows were sold in twelve months, and their places filled by more profitable animals.

AGRICULTURAL SOCIETIES' SHOWS.

Secretaries are invited to forward for insertion in this page dates of their forthcoming shows; these should reach the Editor, Department of Agriculture, Sydney, not later than the 21st of the month previous to issue. Alteration of dates should be notified at once.

1921.

Society.	Secretary.	Date.
Murrumbidgee P. and A. Association (Wagga)	A. F. D. White	Aug. 23, 24, 25
Forbes P., A., and H. Association	E. A. Austen	,, 23, 24
Parkes P., A., and H. Association	J. Heel	,, 23, 24
Corowa P., A., and H. Society	J. D. Fraser	,, 30, 31
Grenfell P., A., and H. Association	G. Cousins	,, 30, 31
Young P. and A. Association	T. A. Tester	Sept. 6, 7, 8
Albury P., A., and H. Society	A. G. Young	,, 6, 7, 8
Gunnedah P., A., and H. Association	M. C. Tweedie	,, 6, 7, 8
Hills District Fruitgrowers' Association (Galston)	R. F. Renant	,, 10
Cowra P., A., and H. Association	E. P. Todhunter	,, 13, 14
Ganmain A. and P. Association	A. R. Lhuede	,, 13, 14
Cootamundra A., P., H., and I. Association	C. H. Inson	,, 14, 15
Northern A. Association (Singleton)	J. T. McMahon	,, 15, 16, 17
Canowindra P., A., and H. Association	John T. Rue	,, 20, 21
Holbrook P., A., and H. Society	J. S. Stewart	,, 20, 21
Temora P., A., H., and I. Association	A. D. Ness	,, 20, 21, 22
Burrowa P., A., and H. Association	W. Burns	,, 22, 23
Henty P. and A. Society	H. Wehrman	,, 27, 28
Junee P., A., and I. Association	T. C. Humphreys	,, 27, 28
Murrumburrah P., A., and I. Association	W. Worner	,, 27, 28
West Wyalong and District P., A., H., and I. Assoc.	T. A. Smith	,, 27, 28, 29
Deniliquin P. and A. Society	P. Fagan	,, 28
Hay P. and A. Association	C. L. Lincombe	Oct. 5, 6
Narrandera P. and A. Association	W. Canton	,, 18, 19
Hillston P. and A. Society	J. E. Peerers	,, 20
Tweed River A. Society	T. M. Kennedy	Nov. 16, 17
Lismore A. and I. Society	H. Pritchard	,, 23, 24

1922.

St. Ives A. and H. Association	A. K. Bowden	Jan. 13, 14
Kiama A. Society	G. A. Somerville	,, 25, 26
Wollongong A., H., and I. Association	W. J. Cochrane	Feb. 2, 3, 4
Shoalhaven A. and H. Association	H. Rauch	,, 8, 9
Central Cumberland A. and H. Assoc. (Castle Hill)	H. A. Best	,, 10, 11
Southern New England P. and A. Association (Uralla)	H. W. Vincent	,, 14, 15, 16
Nepean District A., H., and I. Society (Penrith)	C. H. Fulton	,, 16, 17, 18
Guyra P., A., and H. Association	P. N. Stevenson	,, 21, 22
Moruya A. and P. Society	H. P. Jeffery	,, 22, 23
Newcastle A., H., and I. Association	E. J. Dann	,, 22 to 25
Robertson A. and H. Society	E. S. Martin	,, 24, 25
Tenterfield A. Society	E. W. Whereat	,, 28 and March 1, 2
Oberon A., P., and H. Association	C. S. Chudleigh	,, 2, 3
Berrima District A., H., and I. Society	W. Holt	,, 2, 3, 4
Glen Innes P. and A. Society	Geo. A. Priest	,, 7, 8, 9
Campbelltown A. Society	J. T. Deane	,, 10, 11
Cobargo A., P., and H. Society	T. McKennelly	,, 15, 16
Barraba P., A., and H. Association	C. E. Williams	,, 15, 16, 17
Tamworth P. and A. Association	F. G. Callaghan	,, 21, 22, 23
Hunter River A. and H. Association (Maitland)	E. H. Fountain	,, 22 to 25
Camden A., H., and I. Society	C. C. Irving	,, 23, 24, 25
Upper Hunter P. and A. Association (Muswellbrook)	R. C. Sawkins	April 5, 6
Royal Agricultural Society of N.S.W.	H. M. Somer	,, 10 to 19
Clarence P. and A. Society (Grafton)	L. C. Lawson	May 3, 4, 5, 6

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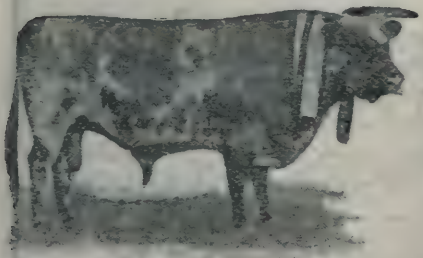

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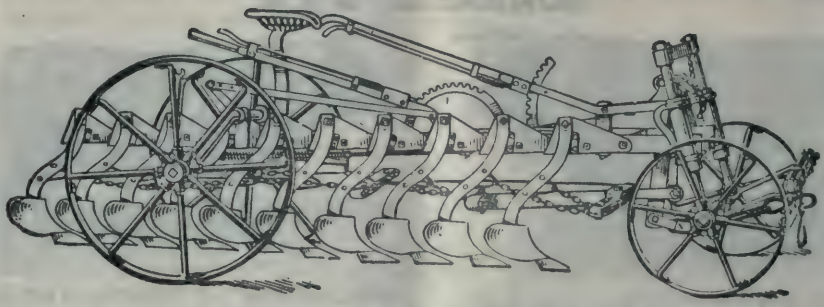

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				1920.	£ s d.
636	Berkshire Sow ...	Koramburra Major, No. 520a	Callan Park Lady, No. 520c	Oct. 17	7 7 0
647	Berkshire Sow ...	Callan Park Dan, No. 600a	Callan Park Lucy, No. 520d	Nov. 2	7 7 0
648	Berkshire Sow ...				
654	Berkshire Sow ...	Koramburra Major, No. 520a	Callan Park Patsy, No. 484	Nov. 8	7 7 0
655	Berkshire Sow ...				
				1921	
657	Berkshire Boar ...	Callan Park Dan, No. 600a	Callan Park Dew-drop, No. 500	Mar. 14	6 6 0
658	Berkshire Boar ...				
661	Berkshire Sow ...				
662	Berkshire Sow ...				
663	Berkshire Boar ...	Callan Park Dan, No. 600a	Callan Park Burra, No. 582	April 16	6 6 0
664	Berkshire Boar ...				
665	Berkshire Boar ...				
668	Berkshire Sow ...				
669	Berkshire Sow ...				
670	Berkshire Boar ...	Callan Park Dan, No. 600a	Callan Park Lucy, No. 520d	April 27	6 6 0
671	Berkshire Boar ...				
672	Berkshire Boar ...				
673	Berkshire Boar ...				
674	Berkshire Boar ...				
675	Berkshire Boar ...				
676	Berkshire Sow ...				
677	Berkshire Sow ...				
678	Berkshire Sow ...				
679	Berkshire Sow ...				

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2527	Large York. Boar	Hawkesbury Ferryman	Gladesville Empress V	Sept. 30	13 13 0
2550	Large York. Sow	Hawkesbury Ferryman	Brighton Lass ...	Nov. 29	11 11 0
2561	Berkshire Sow ...	Whitley Wales (Imp.)	Gladesville May ..	Dec. 22	12 12 0
2564-65	Large York. Sows	Hawkesbury Ferryman	Brighton Lady ...	Dec. 22	10 10 0
2569	Large York. Boar	King Charles II...	Gladesville Lady..	Dec. 22	11 11 0
2571-72	Large York. Sows				10 10 0
				1921	
2577	Berkshire Sow ...	Whitley Wales (Imp.)	Goomalibee Patricia	Jan. 10	11 11 0
2578	Mid. York. Boar	Gladesville Sundon	Gladesville Lila ...	Jan. 20	11 11 0
2580-81	Mid. York. Boars				11 11 0
2585-6	Mid. York. Boars	Gladesville Sundon	White Rose ...	Jan. 20	11 11 0
2587	Mid. York. Sow				10 10 0
2592-93	Berkshire Sows ...	Wodonga Pat ...	Gladesville Queen III	Jan. 21	10 10 0
2600-1	Berkshire Sows ...	Wodonga Pat ...	Herrison Queen IV	Feb. 6	10 10 0
2604-5	Berkshire Sows ...	Wodonga Pat ...	Gladesville Duchess III	Feb. 6	10 10 0
2608-9-10	Berkshire Sows ..	Whitley Wales (Imp.)	Herrison Queen III	Feb. 8	11 11 0
2616-17	Mid. York. Boars	Sundon Sydney (Imp.)	Gladesville Snowdrop..	Mar. 26	10 10 0
2618-19	Mid. York. Sows				10 10 0
2620-21	Large York. Boars	King Charles II...	Gladesville Bourne III	Mar. 12	10 10 0
2622-23	Large York. Sows				9 9 0
2626	Berkshire Sow ...	Whitley Wales (Imp.)	Tarban Jane	April 27	10 10 0
2627-28	Berkshire Boars ...	Gladesville Digger	Short Face Jane III	April 27	10 10 0
2629-30	Berkshire Boars ...				10 10 0
2631-32	Berkshire Sows ...				9 9 0
2633-4-5	Large York. Sows	Hawkesbury Ferryman	Gladesville Empress V	April 22	9 9 0
2636-7-8	Berkshire Sows ...	Wodonga Pat ...	Gladesville Pretty	May 1	9 9 0
2639	Berkshire Boar ...	Gladesville Digger	Gladesville Queen	May 11	10 10 0
2641	Berkshire Sow ...				9 9 0
2646-47	Berkshire Sows ...	Whitley Wales (Imp.)	Thick Haired Jane II..	May 11	10 10 0
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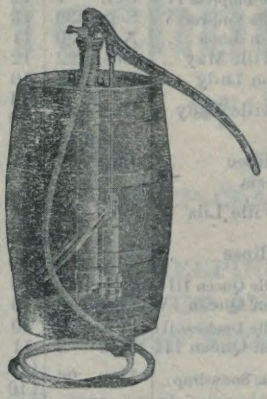

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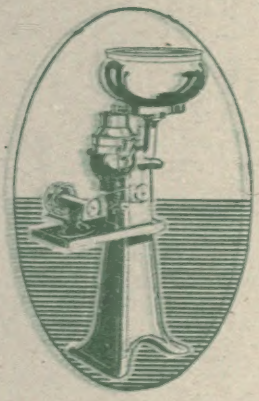

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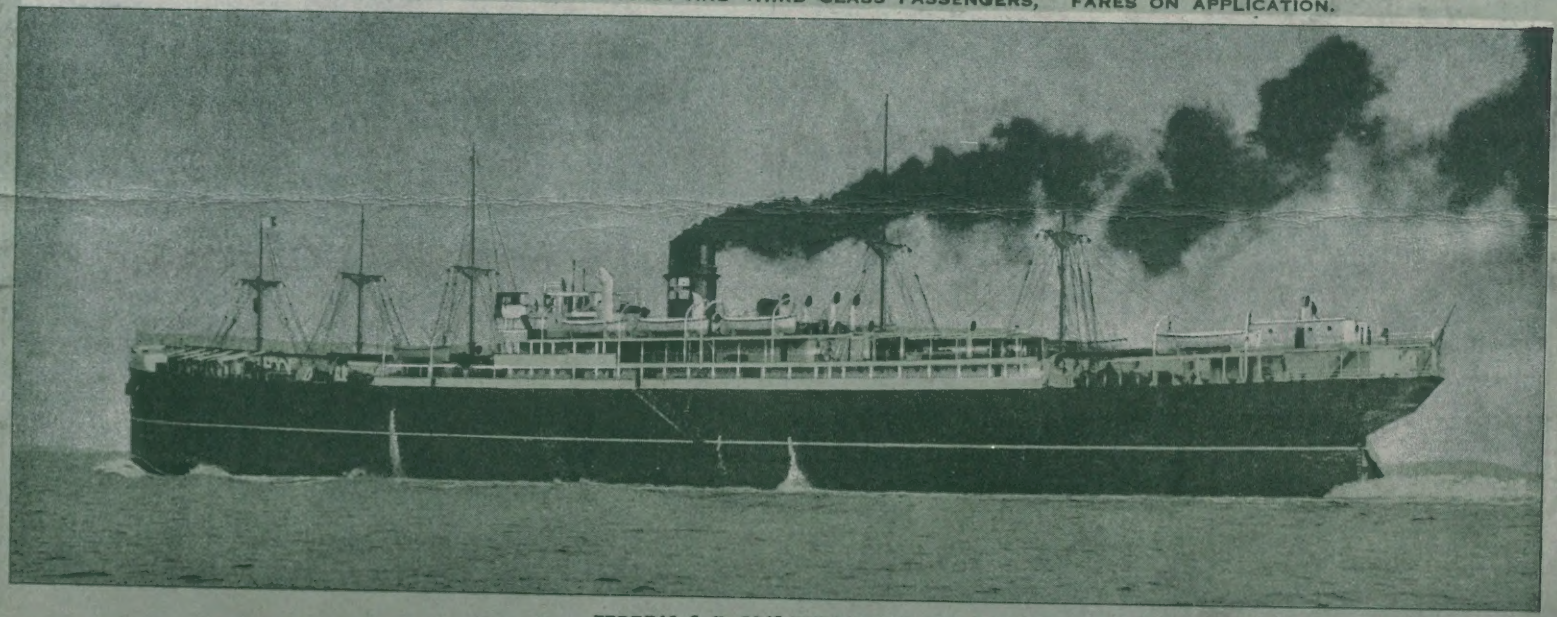

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